

FRIDAY, NOV. 20.

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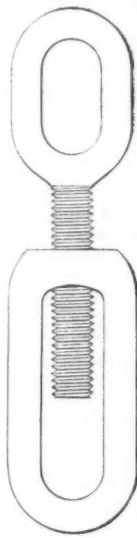
Contributions.

Coupler Unlocking Devices.

NEW YORK, Nov. 14, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice the article in the *Gazette* of Nov. 13 on unlocking devices of the M. C. B. couplers and your criticisms on the many methods used.



As the majority of couplers now in use happen to have the upper lifting rod, which can be made and repaired cheaper and easier than any under unlocking device yet in use, the probabilities are that the simple upper rod 1 in. in diameter, lifting the lock by a forward movement of the handle and with a shoulder on the bracket to set it not to couple, will be the one adopted.

The one difficulty you suggest of the necessity of bending the lifting rod handle or altering the connecting chain has been provided for by the adjustable link, owned by the Thurmond Car Coupling Co., shown in the accompanying cut. This is arranged so that any of the six couplers with locks lifting from above may be substituted when one of the others has been broken and the link adjusted to suit the lift of the lock to the shoulder on the bracket

of the one taken out without any blacksmith work whatever and by any ordinary car inspector.

T. L. McKEEN.

Wootten Boiler Explosions.

Union Pacific System.
NORTH PLATTE, NOV. 10, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am greatly surprised at the statements of "Master Mechanic" in your issue of Oct. 30, under the head of "Locomotive Boiler Explosions," where he says that in two years he has not found a single staybolt broken in over 100 engines equipped with Wooten fireboxes.

The Union Pacific had 15 or 20 of these fireboxes in service on the Wyoming division, and every one that came in for a new firebox had more or less broken stay bolts. In one firebox which was removed I counted over 100 broken staybolts. Most of them were along the sides from just above the mud ring extending up two ft., but there were also many broken in the backhead. They were all broken next the outside sheet.

"Master Mechanic" also states that "the Woottons have required less repairs than any others." The experience of the Union Pacific has been that they require more repairs and wear out quicker than any other form of firebox in use on this road. They are also about twice as expensive to renew.

In consequence of this all eight-wheel engines having Wootten fireboxes that require renewing are being equipped with the common wagon top, and are giving excellent results.

M. K. BARNUM,

M. K. BARNUM,
Division Foreman.

How to Manage Freight Train Men.

WEEHAWKEN, N. J., Nov. 17, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

My paper read at the last meeting of the American Society of Railroad Superintendents, entitled "Economy in Train Service," was written expressly for the purpose of provoking discussion. While holding the opinion that the practice therein described is the best, it was in

the sense that every man thinks his way the best until somebody comes along with something better; and I expected to be repaid for time and labor spent in the preparation of the paper by gaining increased information from the discussion following. Therefore, I was pleased to notice a communication in the *Railroad Gazette* of Oct. 30, in which the writer takes issue with me on several of the claims made in the paper referred to. I will not presume to controvert the views of your correspondent, who evidently has had much larger and longer experience, but will give the reasons for our practice.

First, your correspondent contends that instead of grouping engines and train crews, it is better that they should work separately and independently, or that all freight crews should run "first in first out," and his points are clearly stated. In my paper it was claimed that experience demonstrates beyond doubt that the safest and best work is done by crews kept together on the same runs, on the ground that the men become familiar with the work on their respective runs, and through association are better able to work as a unit. There is, however, another and more important reason for grouping train crews. The fundamental principle of all continued good train service is the character of the men engaged in it—not so particularly as relates to morality, but as to those qualities of mind represented by contentment with the chosen vocation, pride in possessing a recognized individuality, ambition to better the conditions of life, etc. We believe these qualities would be smothered by running train crews first in first out, but that it is possible to produce a gratifying development under the grouping system. Take, for instance, a division with 50 freight crews and run them first in first out. Every man stands on the same footing—conductor, engineer, fireman, brakeman—respectively to the work. Instead of being integers, they are a mass. In other words, the principle is about the same as working Italians by numbers. The farmer, who is suggested by your correspondent as a relief during the busy season, would take the same rank during his temporary employment as the old and tried employé. No man knows when he is going to be called to go out, and can make no arrangement for dividing his time with his family, but must stand ever ready to go at the summons of the call boy. Such conditions are not calculated to produce contentment, pride, ambition, or good citizenship.

Under the grouping system the service is *graded* and the principle of preserving the individuality of the men is more nearly approached. We have five groups:

1. **Special Fast Freight Group.**—These trains run on regular schedules every day and make quick time. The crews report for duty at regular hours. Several conductors on these runs have declined promotion to passenger trains.

2. *Through Freight Group.*—These trains run on regular schedules, and crews report for duty at regular hours every day. The runs differ from the fast freight runs, in that the trains are heavier and more time is consumed in making the trip.

3. *Pick-up Group*.—These trains do the picking up and distributing of loads and empties at local stations, being supplemental to the way freight trains. These crews report for duty at regular hours every day, except Sunday.

4. *Way Freight Group.*—These trains do the distributing and picking up of freight in less than carload lots at all local stations. They run on regular schedules and crews report for duty at regular hours every day, except Sunday.

5. *On-the-rounds Group*.—These crews run "first in first out" and always stand subject to call. They take care of the service not covered by the regular crews.

In busy times all crews make extra trips as may best fit the service. Promotions are in the same order as the groups are placed except that pick-up and way freight crews must be selected with special reference to the physical qualifications the men. A man that can not carry a barrel of oil on his back from a car to station platform across two tracks is not counted an efficient man on the local freight. I will suggest, in passing, that the proposition of your correspondent to cover way freight runs by crew running first in first out is utterly impracticable on a busy division. With 50 crews and four local freight runs the men would not reach the local runs often enough to become familiar with the work. The loading of way freight in different cars with reference to destination is a most important item, and cannot be learned by making an occasional trip. This feature of the service varies as the routing of freight varies. Besides it is doubtful whether five crews, taken as they come, out of any 50 through freight crews in service on any road, will be found physically able to properly do the work on a heavy way freight train. And again, men working on way freight trains require different clothing from those running on through trains, as the lugging of merchandise is not only hard on the man but also on his clothing, and he must prepare himself for it.

Your correspondent refers to the olden time "when there grew up a kind of family circle grouping of the employes" when the superintendent knew his men, and they knew him, as a sleepy period. But what are the lessons to be learned by comparing those days with the present? Are railroad accidents due to the failure of employes growing less frequent? It stands to reason

that with all the improvements in track, equipment and safety appliances, such should be the case, but the record of the past 12 months forbids such a conclusion. How does the trainman of to-day compare with the trainman of 20 years ago? Is he keeping pace with the progress of the time? or, to put it more directly, are there as good men; taken as a class, twisting brakes on freight trains as 20 years ago? If the same question were asked about locomotive engineers the answer would come without hesitation, "Yes, much better." And an important reason for it will be found in the fact that the Brotherhood of Locomotive Engineers has fostered and developed, to a high state of perfection, the principles of graded service: First class, second class, third class engineers, all graded into classes on the basis of length of service, efficiency and good conduct. Your editorial comment is to the point; it is not possible to "level up" the poorest man to the highest standard, and so in placing all freight crews on the same basis, the service is leveled down. But under the grouping or grading system it is possible to establish a high standard and level toward it. Moreover, there springs up a healthy rivalry between the men for the best places, and when discreetly cultivated by the superintendent it becomes the best possible check on the service. Men watch those in the groups above them, and those above, knowing they are watched, are careful to make no slips. As the men in the first group are those who set the example, it is wise to keep them under close surveillance. The suggestion of your correspondent, that it is the old man who frequently gets into trouble, may be accounted for by the mistake of taking it for granted that the old man knows what he is doing and will get along without much watching.

On a division having a heavy traffic it is, of course, impossible that the superintendent should know well every one of his men, but by classifying them into groups he naturally gains a knowledge of his men that would not be possible under the massing system. He studies the first group for passenger conductors, and the second group for men to be promoted in line, and by considering one man's fitness against another, a more or less intimate knowledge of all the men is naturally acquired. It is the principle of distinctness all the way through.

Your correspondent's suggestion, "that a simple remedy for blockaded yards is to limit the number of cars that may be delivered into them at one time," is very good, the idea being, as I take it, that by not sending any more cars into the yard than can be readily handled more work can be accomplished than if the yard were allowed to become blocked by sending in more cars than could be readily disposed of; but my proposition with reference to having cars in proper position in trains was with a view of facilitating the handling of cars and trains as received, making it possible for the yard to accommodate a much larger number of cars than though they were allowed to come in without systematic reference to disposition. By this means the capacity of the yard is increased and the extra expense and annoyance consequent upon cutting trains out at way stations can often be avoided.

It is true, as your correspondent states, that the question how to provide freight crews for the busy season without overworking the regular force and without employing floaters, is a serious problem for the thoughtful superintendent. From the fact that our passenger train service is very considerably expanded during the summer months, we are able to keep nearly the same number of men in the train service throughout the year by transferring from the passenger to freight service, and vice versa, at different periods. Under these circumstances I did not feel competent to suggest a solution of the problem that could be supported by practical experience and merely brought up the point for discussion. However, for some years I have been rather a close student of the causes leading to railroad wrecks, and my conversations with various railroad men lead me to the opinion, as previously expressed, that the most fruitful cause of accidents is the frequent change of men, which cause forbids the organization of a reliable permanent force, thoroughly trained in the methods of operation, and which shall be amenable to discipline. The country is full of men who float around from one railroad to another, and who, rather than accept a suspension or pay a fine for a dereliction of duty, will "take their time." Then there is another class whom the yardmasters designate as "stake men," whose only ambition is to work past a pay day or two for a "stake."

Many of the so-called "old railroad men" who have returned to farms, shops, etc., and who are willing to work for a few months in the winter, belong to this class. Many of these will also quit on the least provocation, and cannot be depended upon to stand the hardships which every trainman is sometimes subjected to and do their duty. My idea is that the floating and temporary class of men should be discriminated against, and a premium placed upon continued faithful service, and that every approach toward a permanent force is in the direction of safety. It is of course largely a question of dollars and cents, but the necessity of meeting it is becoming more and more imperative, and it occurred to me that the best way to treat it intelligently was by general discussion leading to associated effort for the carrying out of some uniform line of action.

W. G. WATSON,

Locomotive Economy.

*Compania Limitada del Ferrocarril
Central Mexicano,
MEXICO, Oct. 29, 1891.*

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the article by Mr. F. M. Wilder, on "Locomotive Economy," in your paper of Oct. 9, 1891. Mr. Wilder does not seem inclined to credit the figures given in my statement of test made between compound engine No. 66 and simple engine No. 107, which appeared in your issue of May 22 and referred to in A. R.'s article in your issue of Sept. 25, 1891.

Mr. Wilder cannot understand why the compound should evaporate more water per pound of coal than the high pressure engine. This is certainly not due to the compounding of the engine, but entirely due to the mild draught, and to the fact that the boiler is not so hard driven as the high pressure and less coal is drawn through the tubes and thrown out of the stack. I know that whenever this point in favor of compound locomotives is made, some one rises to remark that a mild draught on an ordinary engine will effect the same saving. So it will, and I would advise all users of high pressure engines to use a mild draught if they can produce all the steam required to supply the cylinders and make the engine do its full duty, but I have never seen these results obtained, that is to say, I have never seen a high pressure engine with an ordinary boiler make steam freely with so mild a draught as to throw no fire with straight stack and without netting in front end. Reduce the blast to a point where you can do this and engine will not steam, but I am doing this with the compound and getting all the steam needed.

The difference in weight of train is not greater than should be expected, the cars were taken as they came, each train weighed on track scales and sufficient cars put on each train, when there were cars enough, to approximate as near as possible to a maximum of 490 tons in each train. I agree with Mr. Wilder that the best economy cannot be had when hauling light trains, but by examining the tables referred to in the *Railroad Gazette* of May 22, it will be seen that none of the trains hauled by the high pressure engine, No. 107, can be considered light.

Mr. Wilder says a different factor was used in reducing the tons of trains to units on the days the high pressure engine ran than that used for the compound engine. He arrives at this general conclusion without having studied the figures as closely as he should have done, for had he taken the trips of engine No. 107 for Jan. 2, Jan. 4 and Dec. 30, he would have found the same factor (3.26) he discovered in the compound engine's trains. The only reason this factor does not run through all the trips is because on the other trips of engine No. 107 one car was dropped between San Juan and Mexico. Again, if Mr. Wilder will examine the figures given for trips between San Juan and Cazadero, where no change was made in weight of trains, he will find the same factor for all trains of both engines, and just here I would call his attention to the trip of Nov. 15 with the compound, and Dec. 12 with the simple engine. Both engines had 14 cars in their trains; the compound's train weighed 494 tons, while the simple engine had 507 tons (the heaviest train hauled in the tests). As far as possible the conditions were exactly the same, with the exception that the simple engine ran at the rate of 8.8 miles per hour, while the compound made 7.8 miles per hour, and as the resistance per gross ton up 1½ per cent. grade at a speed of 8.8 miles per hour is 35.8 lbs., and that for a speed of 7.8 miles is 35.7 lbs., it will be seen that the simple engine was exerting an additional tractive force due to speed, of one-tenth of a pound per ton, or something less than one-third of one per cent., and yet we find the compound made the run on 1,250 lbs. of coal less than the simple engine. The only chance for an error in these figures is upon the supposition that the simple engine had the heaviest fire in her fire-box at the summit; but as both crews were anxious to make a good showing, and the train sheet shows no delay for either engine at Cazadero, which is not the top of the hill, it is evident both engines had good fires in them when arriving at Cazadero. The same remarks apply equally to the through runs from San Juan to Mexico, the difference in speed does not account for one-half of one per cent. in the performance of the simple engine, and is Mr. Wilder not going to allow something to the compound for having been longer under steam?

I wish to call attention to the fact that in figuring these runs the table used for that purpose in my office is based upon a speed of 15 miles per hour (see *Railroad Gazette* of Aug. 21, 1891, which gives 36.6 lbs. as the total resistance per gross ton up a 1½ per cent. grade. This is slightly in excess of the actual resistance of trains on the trips above cited; but as both engines were figured with the same factor the results of the comparative performance will not be affected to an appreciable degree.

It may be apropos just here to give you the performance of compound engine 66 for 12 months ending Aug. 31, and for that purpose I enclose a table showing the performance of this engine as compared with the three types of heavy engines used on this road. All of the engines whose performance appears in this table were in good condition. The three consolidations were just out of the shops after having general repairs and tubes reset; one entering service in October, 1890, one in January, 1891, and one in February, 1891. The bogies were all new

AVERAGE PERFORMANCE OF VARIOUS CLASSES OF LOCOMOTIVES ON THE MEXICAN CENTRAL RAILWAY, YEAR ENDING AUG. 31, 1891. HAULING FREIGHT TRAINS, RULING GRADES 1½ PER CENT.

Engines.	Cylinders.	Dia. of drivers.	Weight on drivers in lbs.	Grate Area in sq. ft.	Heating surface in sq. ft.	Miles run.	Tons of coal consumed 2,000 lb.	Total expense.	Total units of work performed.	Units of work per gross ton of coal.	Units of work per ton of coal.	Miles run per ton of coal.	Units of work per mile run.
6 Ten-Wheel.....	19×24	57"	68,000	17.	1,222	225,235	9,302.0	\$136,675.84	1,356,662	9.92	145.8	24.2	6.02
3 Consolidations.....	20×24	48"	100,000	30.4	1,641	59,926	2,653.4	41,853.03	415,018	10.63	167.7	22.5	7.42
5 Bogies.....	20×24 14×24 and 24×24	48"	100,000	30.4	1,801	173,799	7,507.3	117,690.00	1,786,187	10.92	171.3	23.1	7.40
1 Compound.....	24×24	48"	100,000	21.5	1,348	28,551	1,043.5	18,279.17	216,072	11.82	207.0	27.3	7.56

engines, just from the Baldwin Locomotive Works, all entering service in September and October, 1890; the compound entered service in August, 1890. The expenses shown in the table do not include that of general overhauling received before any of these engines entered service, but includes all repairs, wages of engineers, firemen and wipers while in service.

It will be seen from these figures that compound engine 66 effected an economy of 20.8 per cent. over the bogies, 23.4 per cent. over the consolidations and 41.9 per cent. over the 10-wheel engines. It will also be seen in the column of units of work per dollar of expense that the compound effected an economy of 8 per cent. over the bogies, 11 per cent. over the consolidation and 19 per cent. over the 10-wheel engines. It is plain from these figures that the repairs on the compound engine absorbed a considerable portion of the profits in the saving of coal, but, under the circumstances we fully expected this to be the case, and in fact the officials of this road were surprised to see even so good balance left in favor of the compound.

This engine (No. 66) was selected for the purpose of compounding as an experiment, because it was one of the most inefficient and useless engines which the company owned; the running gear and link motion being all too light even for an ordinary consolidation engine of the old design, and when changed into a compound and required to perform the same service as the more modern consolidations and heavy bogie engines which are running here, she naturally required more frequent running repairs. Besides this the engine suffered two wrecks during the year, in one of which she ran through a switch and turned over, doing considerable damage. On the other occasion the engine had a butting collision, in which the engine truck and pilot were demolished and one of the cylinders badly broken, requiring a large patch. These heavy repairs are included in the running expenses of the year; none of the other heavy engines shown in this table had to bear any such extraordinary expense; therefore, we are fully satisfied with the performance of engine 66 as these mechanical difficulties can be and have been overcome in the new compounds which we have recently received from the Rhode Island Locomotive Works, and which are now doing splendid work.

Again, should we assume that the performance of engine 66 was the same as that of the consolidations, to wit, 167.7 units of work per ton of coal, in dividing the total units of work performed by engine 66 by this factor we find that engine 66 would have consumed 1,288.4 tons of coal, while she actually used 1,043.5 tons of coal, and effected a saving of 244.9 tons in 23,551 miles run; this, at \$11 per ton, would be \$2,693.90. Now taking the performance of the consolidation engines in units of work per dollar of expense, or 10.63, and divide this into the total units of work of the compound, we find that had the compound's performance been the same as the consolidations, her total of expense would have been \$20,326.62, but her actual expenses were \$18,279.17, therefore, in spite of the compound's mishaps and additional cost of repairs, it effected a clear saving of \$2,047.45 in running 28,551 miles.

By comparing the grate area and heating surface of these engines it will be seen that the compound has somewhat the advantage of the 10-wheel engines, while the consolidation and bogie engines have boilers 22 and 30 per cent larger capacity than the compound.

Taking everything together, it must be admitted that Engine 66 has demonstrated the fact that a great advantage is to be gained in compounding locomotives where fuel is expensive. Upon this showing of Engine 66 the Mexican Central Railroad Co. will compound all of their heavy engines as fast as possible.

F. W. JOHNSTONE, Supt. M. P. & M.

62-In. Belpaire Boiler—Illinois Central Railroad.

Some heavy consolidation engines are now being built for the Illinois Central road which embody several features of interest, especially the boiler, which is 62 in. in diameter, of the Belpaire type. The method of staying is an exception to the usual rule. Instead of rod braces from the boiler head to the top sheet, there are five ¾-in. sheets extending diagonally upward and riveted to 3-in. angle irons at each end. This sheet is made 14 in. wide to allow for the reduction of cross section by the holes for the rods for lateral bracing. The angles on the boiler head are double. Substituting five gusset braces for the ordinary rod stays at the back head adds somewhat to the complication at this end of the boiler, and is attended with some difficulty in the construction in getting all holes in the gussets in a direct line. The bracing across the upper corners just ahead of the flue sheet is

done by fastening 3-in. × 2-in. angles to the side sheet with five rivets and bending the angle iron diagonally over to the top sheet. The sheet at the dome opening is flanged up and riveted with one row of rivets to the dome and strengthened by a 1-in. × 6-in. ring around the base, held by a double row of ¾-in. rivets.

The shell of the boiler is made of flanged steel having a tensile strength of 55,000 lbs. per square inch with an elongation of 28% in four inches. Any sheet showing less than 52,000 or more than 63,000 lbs. or less than 25% elongated is rejected. All boiler rivets are to fill ⅜-in. holes. All longitudinal seams to have butt joints between double welts except seams that are between two rows of stay bolts, these may be double riveted only.

The outside of smokebox sheet is made flush with outside of adjoining boiler sheet, the difference in thickness being made up by an offset in the welt ring to which both are riveted, also the inside liner of the smokebox is fitted in tight between the flanges of the flue sheet and the welt ring.

The firebox is of Otis steel containing not more than .022% of phosphorus, .015% of silicon, .015% of sulphur, or .035% manganese, the carbon being left to the discretion of the manufacturers.

All stay bolts are ¾ in. in diameter and spaced 4½ in. centres. The two top rows at the side are drilled 1 in. deep with a ¾-in. drill for tell-tale holes. The mud ring has double row of ¾-in. rivets. The dip of the grate at the forward end to allow for a deep water space at the throat is very abrupt, the bend in the mud ring being made but 24 in. back of the throat sheet. The flue sheet bracing is made by riveting 8 heavy braces to the cylindrical part of the boiler, as shown. The brick arch rests on three 2½-in. (outside diameter) tubes reaching from the flue sheet to the back sheet, with copper ferules at both ends and beaded over the same as the flues. It is found that the slight difference in expansion in these tubes and the crown and side sheets will be easily accommodated by the slight buckling of the tubes. The 236 two-in. boiler flues are No. 11 wire gauge.

The usual form of rucking grate is used with a dump grate forward, the wrought iron hopper ash pan being fitted with dumping plates having a shell around the back axle.

The locomotives for which the boilers are intended have 21 × 24 in. cylinders and 56½ in. wheels.

Joint Inspection at Receiving Points.

The above subject was discussed at the last meeting of the New England Railroad Club. We condense the discussion below.

Mr. ADAMS: I do not hesitate to say that I do not believe joint inspection can be made a success. We have tested it quite thoroughly in our way, which is similar to the method in use in many places, for a year, and it has cost us considerable more money and didn't give as good service as we hoped, and we have abandoned it, and as the result of that experience I am opposed to it.

Mr. CHAMBERLAIN: I am yet to be convinced that joint inspection is desirable. It is true that the Boston & Maine road has joint inspection, I think in three places, one of them at Ayer Junction, in connection with the Fitchburg road, but that is a case where the business can be done by one man just as well as by two, and it is a saving of expense, and both of us trust that man to do what is right and proper, but when you come to something that means 30 or 40 men on the payroll it is somewhat questionable whether or not equal justice will be done to both parties. We have joint inspection with the Concord & Montreal road, with 10 men on the road, and we get along very well, yet very often cases arise that need adjustment. I am not in favor of joint inspection. In great centres like Chicago, Buffalo, Kansas City, and some other points in the West where the inspection is of great magnitude, more so than it is in the eastern part of the country, the railroads may see their way clear to adopt this method on account of economy and the speedy transportation of freight, but I learn that in some places it gives rise to many disputes and disagreements among the inspectors. I think that the general adoption of joint inspection may lead to the passing of cars from one road to another, and their finally making their way east without any authority to repair the damage done to them.

Mr. MARDEN: I don't know much about joint inspection from practice. We have, as Mr. Chamberlain says, at Ayer Junction joint inspection with the Boston & Maine. The interchange is no larger than one man can take care of. There is one point where our road connects with another, where both roads have 10 or 12 men engaged in this work. I have studied the matter of inspection very carefully, and I have tried to convince myself that joint inspection was the thing, because I thought it more economical, but I have not been able to convince myself of that fact.

I believe it would be a good thing if we could have one man appointed with authority over the inspectors upon the connecting lines between here and Chicago, to instruct them in the method of making inspection, and with reference to defects in cars. It seemed strange to me that if a car was properly inspected in Boston that it should not go through to its destination without being stopped for some defect that had been passed at Boston; and it seems that what we especially need is a uniform inspection of our cars.

Mr. SINCLAIR: . . . The men representing the big roads are highly satisfied with joint inspection, but those representing the smaller roads hold that they are in the position of the lamb that is to lie down inside of the lion. . . . I would like to have a little more light on the subject of old and new defects in cars. The parties I have talked with wanted to know when the defect was a kind of defect that a car should be held for, when it could be held under the interchange rules.

Mr. ADAMS: I am glad this last inquiry has been brought up. I have always claimed that a party breaking a car or doing it an injury was responsible for the

breakage, but we have found in our experience that the party who did the damage will often shirk that responsibility, especially where the damage is not so great as to render the car useless, and the injury is not apparent at first sight. The matter of old defects in cars is the cause of more trouble than any other thing in inspection. There are some roads which will damage a car, and if they can get that car off on another road without putting a card on they will do it every time and claim to be thoroughly honest.

Mr. MARDEN: Concerning old defects I would say that it is our custom to receive cars with old defects if they

are safe to run. If a car is offered us that is newly broken we ask the road to card it to us, and expect them to be responsible for it. It is unfortunate for the older roads that they have a large number of cars built many years ago with sills not adapted to the larger loads which are now carried, and many of those sills have become cracked; they are not easily seen, and they pass until some road happens to find them and the car is cut out. The roads owning such cars should take care of them. The responsibility in some way should be put upon the road where the defects originate. As regards new defects, the road receiving a damaged car may make the necessary repairs and charge them to the road owning the car. We are making a little move in that direction by having brake chains and springs and other things chargeable to the owner of the car. Under our present rules we are subject to much expense owing to the fact that a car is liable to be stopped at different points along the line between here and Chicago on account of old defects, and this also leads to much delay. A system of uniform inspection would do much toward overcoming this and other troubles which now exist.

Mr. LAUDER: I am willing to put myself on record, that I am opposed to any system of joint inspection. I don't believe in anything joint; I believe in each road running its own business.

Rapid Transit in New York.

Last Friday night the Commonwealth Club of New York had a "rapid transit" dinner. The speakers were J. J. R. Croes, Chief Engineer Suburban Rapid Transit until its recent transfer to the Manhattan; Henry R. Beekman, Corporation Counsel during the Mayoralty of Mr. Hewitt; H. G. Prout, Editor *Railroad Gazette*; A. S. Hewitt; J. E. Fitzgerald, Rapid Transit Commissioner of Boston; Rowland Hazard, once Rapid Transit Commissioner of New York, and Francis Collingwood, Secretary Am. Soc. C. E. We have the text of but two of the speeches and those are given below at some length, but not in full.

Mr. Beekman gave a historical review of rapid transit legislation for New York, which was complete and thorough, for he spoke from intimate personal knowledge, having had much to do with the preparation and progress of several of the bills. He favored a tunnel route principally because of the great cost of right of way for an aerial route.

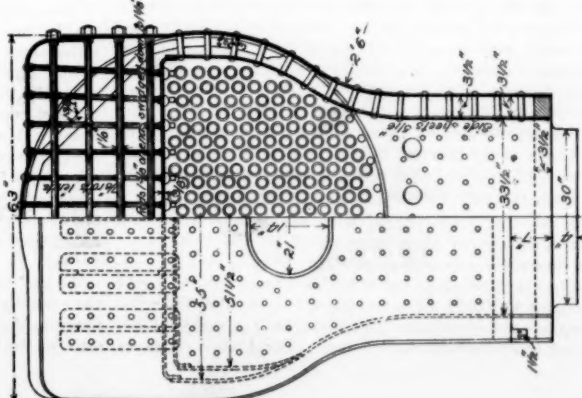
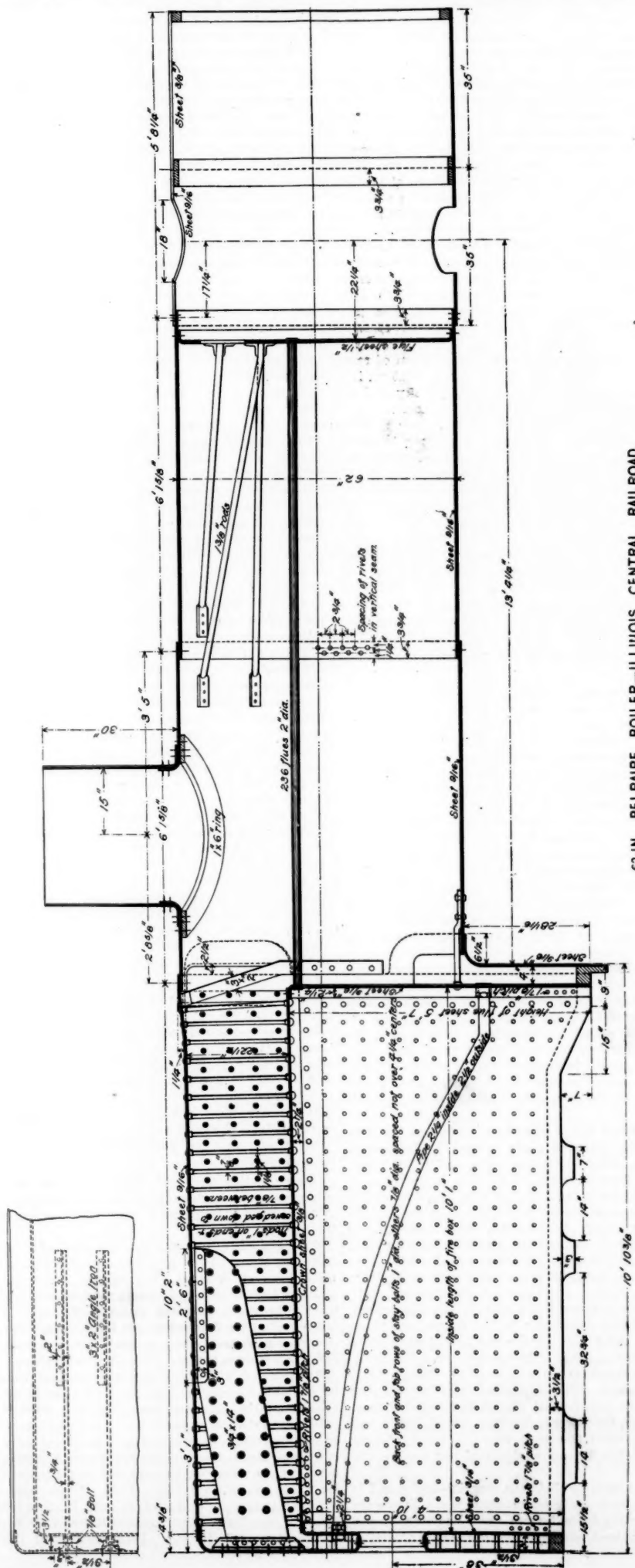
Mr. Hewitt spoke without preparation, not having intended to take any part in the discussion. His talk was partly reminiscent, and that portion, of course, was extremely interesting. The principal points, however, which he developed were that he agreed entirely with the speaker who immediately preceded him in thinking that it was extremely unlikely that the present project of the Commissioners could be financed; and, furthermore, that he was decidedly of the opinion that an aerial railroad is far preferable if it can be secured. In fact he would be willing to consent to a tunnel only if it were absolutely necessary in order to get the capital, and even in that case he is inclined to think that the top ought to be taken off the tunnel.

The addresses of Mr. Fitzgerald and Mr. Hazard were also decidedly in favor of the above ground structures and both confirmed what had been said by preceding speakers of the vital importance of so laying the routes and designing the structures as to catch a large volume of short-distance travel.

Mr. Collingwood's remarks were very brief, but he did not agree that there was any well founded uncertainty as to a profit upon a reasonable investment for a new rapid transit system. On the contrary, any reasonable scheme may be attempted with confidence and will soon develop a paying business. The unsolved portion of the problem is simply as to the best routes to follow and as to the nature of the structure.

A PRELIMINARY SURVEY—REMARKS OF MR. CROES.

. . . Let us take for our initial point the central station of our government, and our information the park around which are grouped the City Hall, the newspapers and the Post Office. To the south of us is a triangular patch of ground a mile wide at its base and a mile long crowded with immense buildings. Into this half a square mile of territory there are brought down town by the present elevated roads every morning and carried up town every evening, within the space of a few hours, about 130,000 people, or about 50% more than the entire population of Albany. Looking now to the north we see first a strip of land a mile long and from one to two miles wide, occupied by enormous business establishments. Into this strip of one and a half square mile area there are brought down every morning, and from it carried up every evening, about 65,000 people. Looking still farther



north we see a strip of land two miles wide and one mile long, containing the great retail business houses of New York, and into this there are brought every morning, and taken away every evening, about 65,000 people. Beyond this is the residence quarter, two miles wide and six miles long, up to the Harlem River. North of this again lies a tract three and a half miles wide and seven miles long, sparsely populated as yet, but growing rapidly, and which it is our aim to populate as rapidly as possible. North and east of this again are the great suburban districts of Westchester County, which send down thousands of people to their daily labor, or to the enjoyment of the pleasures of the Metropolis.

The dividing line of the up and down long distance travel appears to be about Forty-second street, and every day there are about 280,000 people gathered up above that line, and brought down to their daily work, and taken back again in the evening, and distributed to their homes. Besides this, there is a large short distance traffic.

As things are now, only about 60 per cent. of the passengers during the busy hours of the day have seats furnished them; the rest stand. We want to provide seats for all these passengers, and four or five times as many more. . . . To do this we want to give them sitting room in cars traveling on roadways on which long trains of vehicles can be propelled at high speed without interference with other less rapidly moving vehicles or persons.

Now when we look over the territory through which these trains are to pass, we find that it is all occupied by individuals who have certain vested rights which cannot be taken from them without compensation. This ownership of the territory to be traversed, whether it is that in fee of the property, or as an easement in the street on which property abuts, extends moreover from the centre of the earth up into illimitable space, so that if any part of the space is to be occupied for any purpose other than that to which it has been already devoted, its present occupant must be compensated. . . . There is, therefore, a limitation to our occupation of it, which we may describe as caused by a gridiron of impermeable matter, extending from a plane about 15 ft. above the surface of the ground to the same distance below the surface. This impermeable mass occupies the space required for traffic above ground, and for sewers and pipes under ground.

The legislature has provided in various laws that the use for rapid transit purposes of certain portions of the space over and under streets is to be considered a public use and not inconsistent with the uses for which such streets are publicly held, but the courts have held that the owners of abutting property are entitled to compensation for such detriment as results to them from such change of use.

We can acquire, therefore, for our right of way only a strip of space above or below this impermeable mass, and it must be for long reaches, continuously, either above or below, changing from one to the other only where a great change of elevation occurs in the surface in a very short distance. Now, whether it is safer, more agreeable and more healthful to travel on top of this impermeable block, in the free air, or underneath in a close cavern, there can be no doubt in any person's mind unless he has a patent plan of tunneling. The question is not worth discussing. The only problem is to determine which is the cheaper and more advisable, all things being considered.

The latest London fad, as we all know, is to go way down underground, putting passengers into closed cylindrical cans and propelling them like pellets in a pea shooter through dark, damp, deafening, deep laid pipes, as small as possible. Speaking of the London pipe reminds me of the fact that we have here in New York, under our very eyes, a little rapid transit road recently built above ground partly on its own purchased right of way, and partly on streets with the consent of the abutting owners, which is just the same length as the London pipe road, but which cost less, is operated at less expense, carries with more comfort more passengers every day than the London pipe does, and yet is not worked to more than one-fourth its full capacity, and still has proved financially satisfactory to its projectors.

It certainly is very much cheaper to go overhead along a street than it is to go through private property. The structure would cost about the same in each case, but the extinguishing of the abutting owners' rights in the upper strata of air in a street, although an extensive business, costs far less than the purchase of private land and buildings. But there are sentimental and æsthetic objections to occupying any more of our streets with elevated railroads, so what is, at first sight, the next cheapest mode of providing for our wants was adopted, and that is placing the roadway underneath an existing street, and quite near the surface, making a kind of subcellar, or continuous catacomb, to be constructed by methods as yet untried, to be ventilated by means as yet undiscovered, and to be operated by a motor as yet not invented, and cars different from any now in use.

In this case, as compared with an elevated road in a street, the cost of structures would be about the same, the damages to be paid to abutting property owners, including the underpinning of buildings and vaults, would probably be about the same, but there would be the additional cost of excavating and removing the material displaced to make room for the road. The lowest estimate

that I can learn of for the cost of this extra work is \$1,200,000 per mile for a four-track road. Judging from the experience of the elevated roads in the lower part of the city, the damages to abutting owners amount to about one million dollars a mile, so that of the amount which the underground road in the street would cost, about \$2,200,000 per mile would be applicable to the purchase of right of way over private property in case of a different location. This should go very far toward paying for the right of way, particularly if the style of structure be modified in proportion to the value of land, building perhaps a one-story four-track viaduct where land is of less value, a two-story two-track structure where the land is more valuable, or a four-story single-track structure where land is dearest.

But whether it cost more or less, the sanitary conditions connected with an underground road are sufficient to make one undesirable and dangerous in New York.

. . . Every traveler would do what is equivalent to going down into his sub-cellar and sitting there from 15 to 45 minutes, morning and evening. In the climate of New York, on any day between April 1 and Nov. 1, there are very few people who could go down out of the hot street into a cellar, and sit for 30 minutes in company with 50 people of all sorts, and then go out again into the hot street, without great danger to health. . . .

Reverting to the question of cost, it may be safely asserted that the great stumbling block in all considerations of rapid transit heretofore, both in this country and in England, is that we have attempted to force individuals to incur enormous expenses, and take great risks to benefit the whole community, instead of having the community share the burden in the first place. The benefit to be derived from a sufficient system of rapid transit in New York is not an individual matter; it is one affecting every piece of property in the city, and the cost of procuring such a system ought to be distributed over all the taxable property in the city.

The city can procure the money necessary to extinguish all claims of present owners at lower rates than any corporation can, and the burden would not be felt by the community. Whether this right of way should be granted under or over the surface on an existing street, or on a new route, are matters to be carefully studied, but we will start on this study with the absolute knowledge that overhead there are always light and air, room for inspection of track and structures, and certainty as to cost of construction, and that the structure can not cost more than the lining alone of any tunnel, and that the extra cost of the tunnel excavation will be enormous.

REMARKS OF MR. PROUT.

. . . We should free our minds from prejudice in the face of such an enterprise, and not be scared by bad names. If the logic of the case leads to conclusions favorable to the Manhattan company or Tammany Hall so much the worse for the facts, but let us not deceive ourselves. The object of this enterprise is to make money. It has not yet been put on the basis of a public work, but must still be considered as a private undertaking. The vital question then is: Will it pay?

In making an estimate of what a new Rapid Transit system in New York may do, we naturally start with what the present Manhattan system is doing. This is a sound basis, for the existing elevated roads of New York form the most colossal system of urban rapid transit in the world. It is wonderfully successful and skillful in its operating management. Whatever cause of complaint the people of the city may have, this everyone competent to judge knows, that never in the history of transportation has such a mass of passenger traffic been handled with such a degree of speed, safety and comfort. In the last fiscal year about 199,000,000 passengers were carried, the gross earnings were \$10,100,000 and the net \$4,560,000. The passengers were 10 times as many as the New York Central carried in the same year. And with this tremendous traffic the system has yet to kill its first passenger in one of its cars. From the results of such a business we ought to be able to draw some valuable lessons.

Let us see what we can learn from one day. On Monday, Nov. 2, the elevated roads carried 703,782 passengers. Of these 317,835 were carried up and 385,947 down. An analysis of the up traffic shows that 53 per cent. of the passengers are taken on in the first two miles and 96 per cent. of the up traffic is taken on in the first six miles and 90 per cent. in four miles. How many got off in that six miles we cannot tell, but a large part of them doubtless stopped at or below Forty-second street. This will be still more apparent when we examine the down traffic and the business by hours. In the fifth and sixth miles above South Ferry 26 per cent. of the total south-bound traffic was taken on; in the fourth mile 17 per cent.; in the third mile 10 per cent., and 2 per cent. in the last two miles. That is, in the last six miles, or below Eightieth street, 55 per cent. of all the down passengers were taken on. This shows very conclusively that over half of the business of the elevated roads is confined to trips on the lower half of the island, but it does not show how short the trips were. We can get some indication of this by an analysis of the business by hours.

We find that from 6 to 10 in the morning and 4 to 7 in the evening, that is in the seven hours when people are presumably going to and from their business, 57 per cent. of the business was done; but in the other hours 43

per cent. was done. That is, leaving out these seven crowded hours, we find 303,000 people were carried in the hours when people may be supposed to have been making short trips.

The earnings per seat show still more conclusively the value of the short trip business. Taking the whole day through, every seat on the Third avenue line earns $1\frac{1}{4}$ fares, and the Sixth Avenue does nearly as well. In the maximum hour on the Third avenue every seat earns 2.1 fares, and allowing the maximum authoritative estimate for passengers standing, each seat is used 1.2 times in this hour. Again, take the hours when everyone sits down and when the cars are never filled, we find that each seat is used more than once. For instance, between the hours of 2 and 3 p. m. on the Sixth avenue every seat in every car earns $1\frac{1}{4}$ fares. But you will remember that if you board a train either up or down at this hour you will find empty seats in every car.

If these figures mean anything they mean that a very important part of the revenue of the elevated railroads is from comparatively short trips. They mean that if the new rapid transit system is to pay operating expenses and a fair profit on the investment it must be such as to pick up a large number of those people who are going comparatively short distances all through the day.

The system proposed by the Commissioners has been estimated to cost anywhere from \$70,000,000 to \$100,000,000. To earn six per cent. on the lowest of these sums it must carry as many passengers as the elevated roads now carry. To do this it must compete with the elevated roads for short and long distance travel and with the cable roads, horse cars and probably with trolley or other electric surface roads for short distance business. It must begin at once to draw from these lines their present business, for although it will, of course, create new business it will be years before there will be half a million new passengers a day to be carried. And whatever may be the efficiency of the new system it is not to be supposed that the old ones will stand still. With greater competition they will improve in speed and comfort. A small reduction in the number of passengers traveling on the elevated trains will at once remove the complaints of over-crowding and will somewhat increase the speed by making the stops shorter for loading and unloading. Clean and frequent cable cars running eight miles an hour will take people going two or three miles if they have to walk a quarter of a mile to get a faster conveyance, and for shorter distances it will compete even more closely. The same principle obtains with horse cars.

It follows that the new system must be not only quick and comfortable, but accessible. Geographically the Commissioners' lines are attractive, but to be accessible the railroad must be near the surface of the ground. If it is so far below or above the surface as to require elevators these must be large and quick and constantly worked, and of course the stations must be frequent. But such elevators would not only add seriously to the first cost, but would be a heavy load on the operating expenses; and the economical advantages of a deep tunnel or very high structure would be swallowed up. The conditions of attractiveness and comfort are against even a shallow tunnel. The problem of tunnel ventilation is not solved. Whether or not the tunnel accepted by the Commissioners can be ventilated so as to be wholesome and agreeable is not certain. Certainly ventilation and lighting will increase the cost of operating.

. . . That is, economy in first cost is secured in building a low tunnel, but at a constant tax on income and operating expenses for all time to come.

I have said that the new rapid transit system must carry about 200,000,000 people a year to earn interest on an estimated cost of \$70,000,000. This is on the ratio of operating expenses and net earnings of the Manhattan system. That this traffic can be counted on 10 years from now is about as certain as anything can be. That it might be developed in five years is probable; but that it can be had from the start is extremely doubtful. Supposing that 30 per cent. is taken from the elevated roads and 20 per cent. from the surface lines up and down the island, there would still be over 100,000,000 new passenger trips to "create."

I conclude then that with every advantage that can be given to the new system the profit is so remote that the investor must be prepared to wait and to speculate on the future.

The elevated trains run at the rate of 12 miles an hour, including stops. To do this they must often get up to 25 miles between stations. The express trains make 20 miles an hour including 10 stops, and at one point at least they touch 40 miles an hour. Therefore, the requirement of the Commissioners that the motors of the new system should be able to haul a train at 40 miles an hour is none too severe. They fix the maximum grade at one per cent. and they require that the motor shall not be a steam locomotive. The only possible motor other than steam that can come near doing this work is electric, but no electric motor of nearly adequate power has ever been built. An electric motor to take a loaded train of five elevated railroad cars and itself up a grade of one per cent. 40 miles an hour must be able to develop at least 500 H. P. Motors of 50 H. P. are about the best that can be found in use in this country. Those of the City & South London Railway are designed to develop 100 H. P. How successful they are

commercially we can not tell, for the figures are very carefully guarded, but as the official report of a half year's operation shows a profit of about one per cent. on the cost of the enterprise, it is not probable that these motors are very economical. To reason from motors of 50 or 100 H. P. to those of 500 is very risky. I do not say that electric motors of such high powers cannot be built and run economically; but I do say that it has never yet been done, or anything approaching it. I have no doubt that electric locomotives of 500 H. P. will be built and run some time, and probably they will be economical, but in perfecting them some one will lose considerable money. It seems premature, to say the least, to ask men to put their money into an enterprise based entirely on a machine of which the efficiency and economy have not been proved.

Now let us make a short round-up: I conclude that it will not pay private capitalists to build a rapid transit railroad except close to the surface of the ground.

That even under the best conditions a fair interest on the cost of construction will be hazardous for some years to come.

That the use of electricity as a motive power is still speculative.

It follows that the scheme of the Commissioners cannot be financed and that the city will probably have to help build the new system.

Meanwhile it seems rather obvious that great tempo-

Sellers' injectors, 1887 pattern; Westinghouse-American driver and tender brake, with air signal; tender with a water scoop; the boilers have butt joints with double covering strips; the firebox is of the radial stay type; the crossheads are of cast steel, with tin bearings—a new construction.

The cut of the consolidation shows the new design of wrought iron crosshead, which has been brought out to reduce the weight of the reciprocating parts to less than that of the ordinary single expansion engine of equal power. The design of the pistons is the same as that which we have recently referred to, being made of wrought iron, in dies.

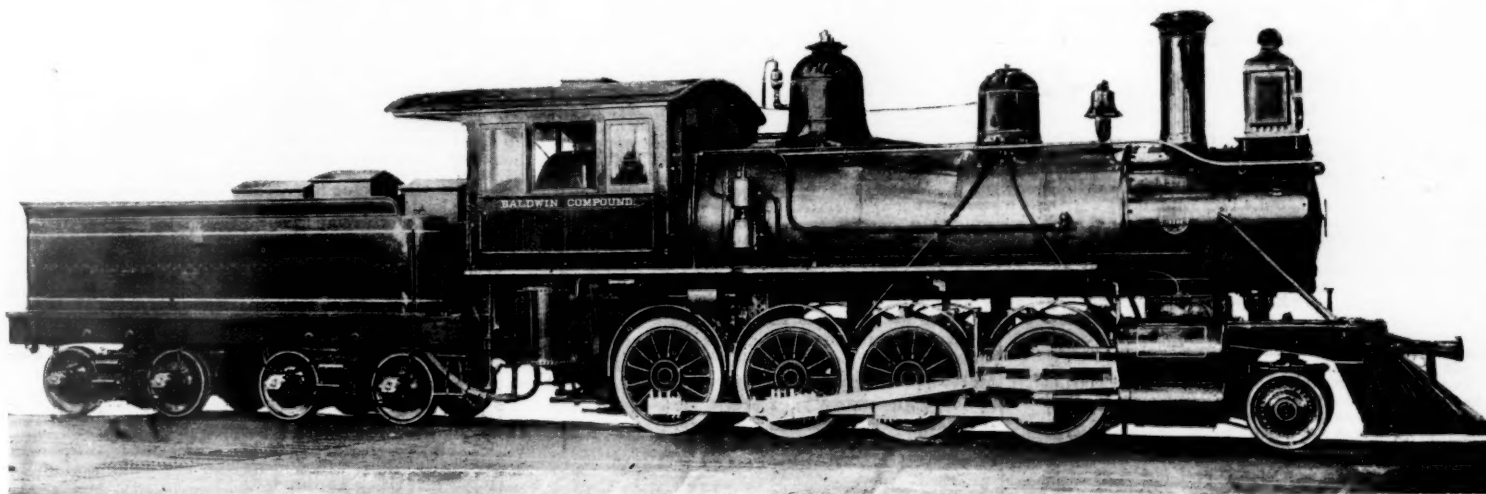
Further Trials of Heavy Armor Plates.

Three more of the heavy armor plates manufactured by the Bethlehem Iron Co., and Carnegie, Phipps & Co., have been tested at the Indian Head Proving Grounds. The first to be fired at was a high carbon (0.45 per cent.) nickel steel, rolled plate of Carnegie, Phipps & Co.; the second was a Harvey treated, low carbon, nickel steel, rolled plate of same company process; the third was a Harvey treated, high carbon (0.45 per cent.) nickel steel, forged plate of the Bethlehem Iron Co.

The high carbon nickel steel plate of Carnegie, Phipps & Co. was penetrated at its upper left hand corner by the first shot to a depth of 12½ in., the shell rebounding

of only 5¼ in. without fringe or bulge. The shell was badly broken up, leaving its point securely embedded in the hole. The third shot penetrated the lower left hand corner 12¼ in., and rebounded in good condition to the ground just in front of gun. There were two or three slight radial cracks to be seen about the hole. The fourth shot penetrated the lower right hand corner about 5½ in. with a bulge of some 13 in. and some slight hair-line cracks. The head or point of the shell remained securely embedded in the hole. It is quite apparent that the right hand portion of the plate is in better condition than the left hand portion, the right hand penetrations being 5½ and 5½ in. against 12 and 12¼ in. of the left. The central 8-in. shot at this plate penetrated 12½ in. into the plate and rebounded, split and partially upset, some 40 ft. Two deep cracks were the result, one extending upward to the top of plate near upper left hand corner and the other extending downward to the bottom of plate through the 6 in. shot hole and to the left hand edge, apparently dividing the plate into two portions.

A conclusion that can safely be affirmed from these tests is that the Harvey process as applied to these plates has not been as successful as has been expected. Both plates show an uneven temper and hardness; the 20¼ and 9¼ in. of penetration of the lower portion of the low carbon plate differ materially from the 14¼ and 14¼ in. of the upper portion of the same plate and from the 15¼ in. of the central portion. The 5½ and 5¼-



COMPOUND CONSOLIDATION LOCOMOTIVE FOR THE MASTER MECHANICS' ASSOCIATION—VAUCLAIN SYSTEM.

rary relief can be had, and that very quickly, by giving to the existing elevated system additional privileges. These I know are unpopular conclusions, but they ought to be considered rationally. . . .

Vauclain Compound Engines for the M. M. Committee.

The committee appointed by the American Master Mechanics' Association to report on compound locomotives has already made considerable progress. The locomotive builders, except the Baldwin people, are hesitating about furnishing sample engines for test. It is understood that the Rhode Island Works will furnish such an engine equipped with starting gear under the Lythgoe patents. The Baldwin Works will furnish two engines, one compound ten-wheeler for passenger work and a compound consolidation for freight work. The illustration with this shows the consolidation. The following are the dimensions:

Diameter high pressure cylinders, 13 in.; diameter low pressure cylinders, 21 in.; stroke 26 in.; diameter of drivers, 51 in.; diameter of boiler shell, 60 in.; tubes, 2 in. diameter outside, 12 ft. 11½ in. in length, 261 in. number; firebox, 102¼ in. long × 41½ in. wide; shell sheets, ⅜ in. thick, riveted with 1-in. rivets; all longitudinal shell seams with double covering strips and butt joints; truck wheels, 39 in. in diameter, chilled, plate; driving-axle journals, 7½ × 9 in.; steam ports, 21¼ in. × 1½ in.; exhaust port, same length, 7 in. wide; valve travel 5 in. Outside lap, high pressure, ¾ in., low pressure, ½ in. No inside lap. Injectors—One No. 9½ Freedman monitor, one No. 8½ Sellers 1887 pattern. Westinghouse American driver and tender brake. Tank capacity, 3,300 gallons. Fuel, soft coal. Total wheel base, 21 ft. 9 in. Driving wheel base, 14 ft. Weight in working order, 122,000 lbs.; on driving wheels, 108,000 lbs. Tender, 66,000 lbs. loaded.

The ten-wheeler is built according to the latest Baldwin practice and has the following general dimensions:

Diameter of high pressure cylinder, 14 in.; diameter of low pressure cylinder, 24 in.; stroke of piston, 24 in.; diameter of drivers, 72 in.; diameter of shell, 62 in.; diameter of tubes, 2 in.; length of tubes, 13 ft.; number of tubes, 270; length of firebox, 120 in.; width of firebox, 33½ in.; total wheel base, 23 ft. 4 in.; driving wheel base, 5 ft. 6 in.; weight on drivers, 102,000 lbs.; weight in working order, 125,000 lbs.; weight of tender loaded, 72,000 lbs. This engine has the following specialties:

Truck wheels, Vauclain wrought iron centre, with steel tire and retaining rings; Nathan side-feed lubricators;

some 36 ft. without apparent injury. The hole was considerably bulged, and the metal chipped off instead of fringing. The second shot penetrated the upper right hand corner to a depth of 10¼ in., rebounding badly broken up, the main portion dropping immediately in front of the gun. The bulge was somewhat worse than that of the first shot, and two or three slight radial cracks showed themselves. The third shot penetrated the lower left hand corner of the plate some 12 in., and the projectile remained imbedded in the plate, but broken up. A crack one-eighth of an inch in width resulted, extending from the hole to the lower central portion of the plate. The fourth shot penetrated the lower right hand corner of the plate 11¼ in., and rebounded in good condition. Two new cracks were seen, and the crack of the third shot was increased somewhat in width. The central or fifth shot fired from the 8-in. gun penetrated the centre of the plate to a depth of 9¼ in. and a bulge of 20 in. The cracks already shown were considerably enlarged and a new and quite wide crack was developed extending to the upper portion of the left hand edge of plate.

The low carbon, nickel steel, Harvey treated plate of Carnegie, Phipps & Co. was penetrated at its upper left corner by the first shot to a depth of 14¼ in., leaving a slight bulge and one or two small cracks, with portions of plate chipped away. The second shot penetrated the upper left hand corner 14¼ in., the shell remaining embedded in the hole, with no other apparent results. The third shot penetrated the lower left hand corner 9¼ in. and rebounded some 50 ft. The hole was quite irregular in shape and the edges somewhat chipped and broken. The fourth shot penetrated the lower right hand corner to a depth of 20¼ in. and remained in the hole. This penetration, it will be noticed, is some 6 in. deeper than either of the other three previous shots at the same plate. The fifth shot, from the 8-in. gun, penetrated centre of plate to a depth of 15¼ in. and rebounded badly broken up. A deep crack was the result, extending from the upper left hand edge diagonally across the hole of the 6-in. shot to the centre, a second crack extended from the centre hole to and through the lower left hand 6-in. hole to the edge of plate. The cracks were slight, however, and not so marked as those of the previous plate.

The high carbon, nickel steel, Harvey treated plate of the Bethlehem Iron Co. was penetrated at its upper left hand corner by the first 6-in. shot to a depth of 12 in., the shell rebounding badly broken up some 46 ft. The hole was badly chipped but was not bulged. The second shot penetrated the upper right hand corner to a depth

in. penetrations of the right hand portion of the high carbon plate differ materially from the 12 and 12¼ in. penetrations of the left hand portion. The results would likewise point to a different method of tempering. The plate, however open even to these individual criticisms, surpasses the others in general value, and is by far the most successful plate of all. The penetration averages much less than the others, and the cracks at least one-third less.

There are still two more plates to be tested—a 0.25 per cent. carbon, nickel-steel plate and a 0.25 per cent. carbon, all-steel plate, the latter being Harvey treated.

Care of Steam-Heated Cars.

At the last meeting of the New England Railroad Club a discussion on "The Care of Steam-Heated Cars at Terminal Points" was opened by Mr. J. N. Lauder, as follows:

The heating of trains continuously from the locomotive has undoubtedly come to stay. The matter of heating the trains while on the road after they are equipped with any of the existing systems is at this time a comparatively simple matter. The greatest difficulty to-day existing in the heating of trains by continuous heating is the preparation of the cars before they are made up into trains and their care at terminal points.

Some two years ago the question of taking care of our cars on one division came up, that division being heated with steam. At some points, as a makeshift, we used old locomotives; at others we used road locomotives; but at some of the leading points we put in steam plants, notably in Boston. These steam plants, with the exception of the boilers and boiler house, had to be all torn out and done over again; consequently, the expense of putting in pipes to convey steam from the central plants to the points where it was necessary to do the work was thrown away. We had put the steam pipes in the ground in wooden boxes eight inches square, inside measurement, made of two-inch plank, properly fastened together, the pipe being covered with a non-conducting material. That winter we managed to keep the cars in fairly good condition. One morning we found the yard two or three inches under water as a consequence of an exceptionally high tide accompanied by a heavy storm. We therefore had no steam.

Early last spring we commenced on an entirely different plan, and arranged to keep the pipes out of the ground, starting at the boiler house and carrying the pipes high enough to pitch them gradually to the farthest point where we needed to use steam, thus obtaining a very much better system. So far it has worked admirably; we have no trouble to get dry hot steam at any point; no trouble from condensation more than is incident to carrying steam long distances, however well protected.

I am aware that there are many cases where the steam must go under ground. In one plant at Kneeland street we were obliged to go a portion of the way under ground, but got out of the ground and carried our pipes into the

train shed as soon as possible. This plant has been running several weeks, and has given us very good results. At Dover street we were obliged to go into the ground the entire distance, owing to the peculiar conditions there existing.

Steam-heating men and railroad men generally interested in this matter have a very inadequate idea of the difficulties of heating cars by steam from the locomotive on some of our roads, notably the Old Colony and the Boston & Maine, which are made up largely of branches in the vicinity of Boston. Both roads have a vast number of cars to be taken care of during the night and got ready for the morning trains coming into Boston. In the case of the Old Colony we have cars at 41 different points during the night. The question of keeping cars warm at terminal points is a very serious one, and the putting in of a permanent steam plant is a large expense; taking steam from the locomotive to do the same work is a still greater expense.

How can this heating be accomplished? At some points cars can be allowed to cool off, provided they are warmed with straight steam, not in connection with a Baker heater. But if the system is one where a Baker heater is used, or in other words is a hot water system, and not a steam system, the case is different. Where the cars are set off at night and stand eight or nine hours until the next morning, however warm they may be when they are left, everything will be frozen solid before morning in a cold winter night; so that, where there is not straight steam available, the necessity for having them kept warm is imperative. Where straight steam is used, the couplings can be unfastened and the water allowed to run out, and in the morning the locomotive brought out an hour before the time for starting, and the trains made ready in time for use.

As to the amount of steam it takes to do the work: We built a boiler house and put in two 54-in. upright boilers at Dedham two years ago, thinking that would furnish ample steam to take care of the cars over night at that place. But we had to supplement them with a locomotive, because the two boilers would not furnish steam enough to keep 65 to 75 cars warm from midnight until 5 o'clock in the morning. Now we have four 54-in. upright boilers there to keep the cars warm while they are standing on these sidings.

Two years ago I made a careful estimate in detail as to what it would cost to get the passenger trains of the Old Colony road, including cars and locomotives, ready for steam heating. Necessarily a large number of my figures were estimates, but a large number were known facts. I also made an estimate of a number of men who would be permanently added to our pay roll. I found that it would cost to get our trains ready to be heated by steam \$198,000, and that 76 permanent men would have to be added to our pay roll. I put them at two dollars a day, which I think is a conservative estimate, as you have to have men of some skill to trust with steam boilers and steam heating. These figures are certainly low enough, and it shows what enormous expense the railroads have to incur in these matters.

In equipping a road for steam heating, we consider it absolutely necessary that every locomotive on the road should be equipped, both forward and back, for steam heating. There is not an engine on our road but is liable to be hitched to a passenger train at some time, to cover an emergency.

Mr. MARDEN: As far as the Fitchburg road is concerned, we are quite satisfied with steam heat as we are now using it, for heating our passenger cars at terminal stations. We have 22 or 23 points only where we have passenger cars stationed during the night. We have provided steam plants for heating our cars at Boston and at Troy. At the other points on the road they are taken care of by locomotives, and we have no serious trouble in so doing. At Boston we have to place the pipes in boxes about six or eight inches under ground. We had in the first place an upright tubular boiler, but that has been displaced by a locomotive boiler, and we have no difficulty in keeping the cars warm and ready to go out in the morning in a comfortable condition.

This matter of heating cars at terminal points and having them stand out over night was one that impressed me very strongly when we took up the matter, and on that account more than anything else I recommended the application of direct steam for passenger cars, so that we might leave them anywhere on the line, and during last winter we had but one car freeze up, and that was equipped with Sewell's first system. I think in our cold climate that roads which are equipping their cars with Baker heaters, or any other form of hot water heater, not keeping any fires in the cars over night, will have to provide, at all points where the cars lie out over night and at terminal points, some means of keeping those cars warm. I don't know that I can offer any system better or different for heating cars at terminal points than we are now using.

Mr. ADAMS: I suppose it is well known to all here that the Boston & Albany road was among the first that adopted steam heat in Boston and vicinity. We had trains running heated in that way a year before anybody else, and perhaps longer. We have provided very much in the same manner as the Old Colony, although in most cases we do not have to provide special plants. We had boilers adapted to that use at different points where the cars are stationed, which keep them comfortably warm, and the greatest complaint that I have heard is that they come into the station too hot. We have a plant here in Boston, and also at Worcester, Framingham and Springfield, and at all points where our cars remain over night we are provided with facilities for heating them. We have some branches where we have not made any provision of this kind, but there are few cars and few trains, and there are roads with mixed trains. We have kept the Baker heaters in those places. It is not easy to heat such trains by steam, with 15 or 20 freight cars between the passenger cars and the engine.

Purges for Locomotive Boilers on the Chicago, Milwaukee & St. Paul.

Attached to Mr. J. N. Barr's paper on "The Treatment of Waters Used in Locomotives to Prevent Incrustation," which was given last week, is the following appendix. This is a report from E. M. Herr, Division Master Mechanic at Milwaukee to Mr. Barr, giving the results of using a boiler purge on the locomotives under Mr. Herr's supervision:

The amount of boiler purge necessary to take care of the incrusting matter in the various waters used has been calculated from data furnished by the laboratory. The total amount of purge required is shown together with the amount actually used. The purge is now all put in the tanks of engines before they leave terminal point round house, and is therefore entirely beyond the control of the enginemen. There is a great deal of dif-

ference in value of a given quantity of purge in water containing the same amount of incrusting solids, depending upon whether they are in the form of carbonate or sulphate of lime. For example, on the East Prairie du Chien Division the average of boiler waters most frequently used contain incrusting solids composed of 97 per cent. carbonate of lime and 3 per cent. sulphate of lime. Theoretically, this would require, per 1,000 gallons, 2½ quarts of purge, assuming it regenerates four times. We have used about 1½ quarts per 1,000 gallons for past seven months in two passenger engines, with no scale, until quite recently a slight amount of deposit was noticed in a few inaccessible places on sheets of one engine, the other remaining clean. The amount of purge was then increased to 2 quarts per 1,000 gallons, and both engines now show no indication of scale forming.

On the Chicago and Milwaukee passenger runs there is used about 11,000 gallons of water containing on an average incrusting solids composed of 94 per cent. carbonate of lime and 6 per cent. sulphate of lime. This water requires per 1,000 gallons 2½ quarts of purge on same assumption as above. Nine-tenths of a quart of purge per 1,000 gallons of water was first used nine months ago, the amount being gradually increased to slightly over 2½ quarts per 1,000 gallons. This amount has been in use only a short time, but engines already show an improvement. How much more purge the additional amount of sulphate in C. & M. Division waters will require we can only determine after longer tests.

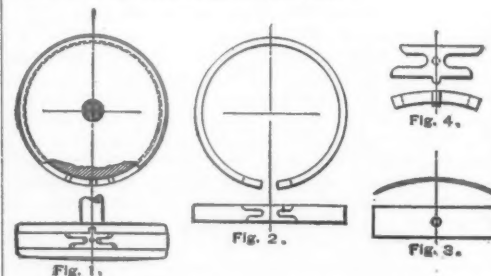
Attached statement shows amount of purge used on important runs of various divisions compared with theoretical amount required, assuming a fourfold regeneration. The results are as follows:

The East and West Prairie du Chien, Mineral Point and East and West La Crosse Division engines have improved steadily since present method of supplying compound was adopted, and are now practically clean. The R. & S. W. and Northern Division engines have all improved, but on account of bad water on both divisions the full amount of compound required theoretically to prevent scale forming was not applied at first, nor is it now. The amount used is being increased as fast as boiler indicates the formation of scale. The C. & M. & C. & C. B. divisions in Illinois are now in the most unsatisfactory condition on account of an insufficient supply of compound being used at the start. The large amount required by the heavy water consumption due to the heavy trains hauled on the former, and long run between terminals on the latter, was not appreciated until the water consumption was obtained. The C. & M. Division is now receiving about the right amount on passenger engines, but freights are still probably receiving too little; both this and amount used on C. & C. B. Division will be increased at once.

Attached to this report are letters from various engineers, which attest the value of the purge and state in detail how it is used. A table is also appended giving the amount of purge required for 1,000 gallons of the water put into the locomotive tank. This table shows the care which must be exercised in using any purge to neutralize feed water. A hard and fast rule that will answer for all classes of water as claimed by some is impossible.

Gutierrez's Piston Packing.

The form of piston packing shown in figs. 1, 2, 3 and 4 has been in use for the last three years on locomotives with 20-in. cylinders without failure, and has kept tight during that time. The packing is constructed as follows: The ring, fig. 2, is turned up, as shown, and milled on the ends to receive a joint piece, fig. 4, with a spring at its back, shown by fig. 3. The whole device, when inserted in a piston, is shown in fig. 1. The joint is placed at the bottom of the cylinder.



The object of the joint piece is to prevent leakage in either direction, and the ends are made of unequal length in order to prevent wearing a groove in the cylinder. Further description as to construction is unnecessary. It is simple and inexpensive. It is proposed to use only one ring in pistons having this packing, as one is sufficient to prevent steam from passing through, and it is intended to reduce the thickness of the piston and lighten its weight. The device is controlled by M. F. Gutierrez, Altoona, Pa.

Air Brake Practice—Discussion at the Western Railway Club.

The discussion of Mr. G. W. Rhodes' paper on "Air Brake Practice," which was read at the Western Railway Club in September, was mostly on the questions of the proper limitation of piston travel and the best way to test brakes before starting from stations. The following is the gist of the discussion:

Mr. SCHROYER: I especially agree with Mr. Rhodes in his views concerning length of the piston travel. Our practice is the minimum 6 and the maximum 8. On our entire passenger traffic we have a device which records automatically the length of the piston travel, and it has reduced our expense in maintenance, in so far as adjustment was concerned, by probably two-thirds. It obviates the necessity of this work, as the piston travel can be determined at any time and without the application of the brakes. On Saturday last out of 40 cars there were 19 in which the brakes were of no service whatever, because of there being 12 in. travel.

Mr. RHODES: At the Burlington brake tests, the parties who had brakes for test were exceedingly anxious

that the shortest travel should exist. One of our rules was that the brakes, once they started on the test, should not be readjusted; some of the loaded cars which were tested with short piston travel when unloaded for other tests were found to hug the wheels. They were fastened to the car body, and in some cases they were so closely adjusted that they held the wheels and caused them to slip after the car was unloaded. Even when this was remedied, we found that the close adjustment of the piston was such that when we made the grade test the cars in some cases would not run. So closely were they adjusted that the brake shoes dragged on the wheels sufficiently to prevent the train from running freely, and, if you will remember, one train was stopped dead on a down grade entirely from this cause.

The conditions, however, have changed a good deal since those tests were made. We are to-day using a different kind of rigging, iron brake beams in place of wooden, and the result is that we have everything tight, and there is a minimum of slack in it. In order to see what the variation is in piston travel now between light and loaded cars, with iron beams and close fitting connections, we have had a few tests made at Aurora this week. The results were:

Tests of Piston Travel with Empty and Loaded Cars.

1. Inside hung brakes, C., B. & Q. refrigerator, 30,251; capacity, 40,000; light weight, 31,450 lbs.

Travel, empty..... 4 inches, 70 lbs. pressure loaded with 42,000 lbs..... 3½ "

Practically no difference, the slight variation being probably due to the fact that the journals can be spread under the brass a little further with light load than with heavy load.

2. Outside hung brakes or brakes attached to the body of the car. C., B. & Q. refrigerator 30,008; capacity, 40,000 lbs.; light weight, 29,000 lbs.

a. Travel empty..... 4 3-16 in., 70 lbs. pressure loaded with 42,000 lbs..... 4¾ "

b. Travel empty..... 4¾ " " " (same load)..... 10 3-16 " " "

These last two tests indicate a variation of about one-half inch between an empty and loaded car, in case of the brake beams being hung to the body of the car. The tests with the inside hung brake shows clearly the importance of hanging the brake beams to that portion of the truck that is not affected by the load of the car.

Now there being little variation between the empty and loaded cars with inside brakes and our present rigging, it brings up the question as to whether it does not entirely change the status of a piston regulator. When there is so little variation, due to slack in connections and between light and loaded cars, it seems to me possible for piston regulators to be used. I am informed that on the German railroads there are about 12,000 piston regulators in successful operation. I think the Master Car Builders' Committee might, in case they should be successful in finding a piston regulator, consider the following:

Brakes under all tenders, passenger or freight car equipment should be adjusted so as to maintain a uniform piston travel of 7 inches. Piston travel must not be allowed to be less than 6 inches or more than 9 inches.

I think we should have a fixed travel, which we should aim to secure, and then make the maximum and minimum as little as we can.

Mr. CLOUD: The best efficiency of the brakes would be had by uniformity for the piston travel, whether that be 6, 8 or 9, does not matter, if you have figured accordingly, but I should say 7 would be a very good figure; and when regulators have been introduced and found to be successful, such figures can be used very well. In the meantime, I understand these rules are made to take care of what we have in service, and if it be desirable to change the minimum of 4 to any other figure, I should think 5 would be a better figure than 6.

The leakage groove is covered by a travel of 3 to 3½ in.; therefore 4 in. gives you at least ¾ in. to offset the difference in the brake riggings.

Mr. SCHROYER: I should like to have an expression from some of the air brake instructors or experts of the railroads as to whether it is good practice to make a light application, or whether we should let the cars bunch up before the application is made. Much damage is being done in having our trains bunched by the negligence of the engineer.

Mr. CLOUD: With freight trains which are only partially equipped with the air brake, especial care must be used to take up the slack from the train before the brake is applied.

Mr. NELLIS (Westinghouse Co.): Taking up the slack before putting on the full application of the brake is an important point. Shutting off the steam will ordinarily allow the slack to take up, but if it does not 3 or 4 lbs. of air should be let out, just merely to take up the slack, and that should be done before the brake is fully applied. But there should be enough let out to cover the leakage groove, and not run any risk from that point.

President PECK: This is a very important question, I think. It is not long ago since I saw an empty flat car broken in two by the bunching of the train upon the application of the air brakes. It had to be taken off the track a complete wreck.

Mr. HERR: I think that a point which should be brought to the attention of engineers, is that you are liable to have much more violent and dangerous shocks when moving slowly than when moving fast. A train when moving 25 or 30 miles an hour will stand a much more severe initial application than a train running at a speed of five or six miles.

Mr. KIDDER (Westinghouse Air Brake Co.): It is necessary for the engineer to use a certain amount of discretion, because the topography of the road is generally such that in some places the cars will take up the slack themselves, while under other circumstances a slight application of the brakes is necessary to take up the slack.

Mr. RHODES: While we have the engineers with us, I would like to ask their opinion on another question which this paper touches, on page 4 of the September proceedings, paragraph 5.

"After the engineer is satisfied that there are no serious leaks in the train, he will, at a signal from the inspector or trainmen, apply the brakes and leave them so applied until the brakes on the entire train have been inspected and the signal is given to release." We would recommend inserting after the words "apply the brakes," the following: "by exhausting all the air from the train pipe."

I have not heard any particular criticism on that point, but one gentleman did remark to me that he did not quite see where the arguments which we gave for that came in. The main argument we used was that it enabled the engineer to determine whether he had a short or a long train pipe. This gentleman said that he did not see what advantage exhausting all the air out of the train pipe gave an engineer, and he asked why the

engineer could not determine, by watching his gauge, the reduction of air in the train pipe, and thus determine whether he had a long pipe or not. One answer that I would make is that the brakes are applied and tested as much during the night as during the day, and we all know that the air gauge in the cab of an engine in the night time is very indistinct (in many cases you cannot see the figures or even the hand), and you have got to be governed by the sound entirely. Further than that, we all know that the practice of the engineers, when they want to make a stop, is to watch the place they are going to stop at, and then apply the brakes and judge by the sound how much air they are letting out. It seems to us that teaching them to determine the length of the train pipe by the sound is the true way.

Mr. SYNNESTVEDT (C. & N. W.): There is another thing that makes it very important to let all the air out of the train pipe in making the test of brakes; you may have some cars the reservoirs on which are not filled. I have seen an extra car—a sleeper or a diner—attached to a train; they stand a moment and the brakeman gives the engineer the signal to try the brakes; the car just connected has less air than the others and its brake does not go on, and I have seen men make three or four, and sometimes more, applications of the brake to satisfy the brakeman that it was all right. All that trouble would have been avoided had the engineer exhausted all the air from the train in trying the brakes.

There is a way which I have not seen mentioned by which an engineer can test the length of the train pipe while running on the road, without making an application of the brakes at all, and by which he can tell within two cars. If the engineer's valve handle stands in the proper position, one gauge pointer will show 20 pounds excess pressure. Now, by pushing the handle to the release position and watching how far the red pointer falls you can tell very nearly how many cars there are in the train. We find that when there are 15 cars in the train it will go down almost exactly a pound to a car; the longer the train the less per car. Suppose a man is running on a dark night and has a meeting point or a crossing to make; he may have a suspicion that all the brakes are not cut in. He can tell very easily by slipping the handle around and watching the red pointer as I say. I have often done this and guessed the number of cars, and then gone back and counted them, and I never missed by over four cars, even on trains of 15 or 16 cars.

Mr. COTA: Our instructions to our trainmen always are to let all the air out of the train pipe. Suppose we come to a station with orders to pick up a coach. The chances are the auxiliary reservoir on that car is empty. Our brakeman opens the connection from one car into the car we are taking up; perhaps by the time we have 30 lbs. pressure in the auxiliary reservoir of that car the brakeman says "try your air." The engineer perhaps will let out one-third of the train pipe pressure, bringing that pressure down to about 50 lbs. or less. We have yet more train pipe pressure under that one car than we have air left in the auxiliary reservoir, and until we reduce that train pipe pressure to less than there is in the auxiliary, that brake will not apply. He doesn't look to see if there is any air; he says, "this brake won't work," and he cuts it out.

Mr. QUAYLE: I believe that a 20-lb. reduction is sufficient. It seems to me that we go at this matter in the wrong way. The engineer is the man that ought to give the signal for the test, instead of the brakeman, and then, when he gives the signal, the brakeman is to be at his post. I believe it is essential at every terminal point to go along the full length of the train and observe closely if the brakes are properly set and if the piston has the proper travel. It seems to me that because of the carelessness of some employees, we are trying to put a duty on another employee, while he has sufficient duties to attend to.

Mr. RHODES: I have a few questions and answers which I want to present to the club as desirable to add to the proposed rules. The position we take is that coaches will run in our passenger trains with the brakes inoperative, and therefore that there should be rules governing such cases.

PROPOSED NEW QUESTIONS AND ANSWERS.

Q. a. If the brakes on a coach in a passenger train do not work, what should be done?

A. a. Whenever there is any trouble whatever with air brakes on passenger trains, it should be located and the repairs made, if possible, before leaving the station where the trouble is discovered.

Q. b. If the repairs cannot be made, what should be done?

A. b. If the repairs cannot be made and the defect is not connected with the train pipe, the air to the triple valve must be cut out, great care being taken to see that the stop cocks are left open, so as not to impede the passage of air to cars that may be at the rear of the one with defective brakes.

Q. c. Should the main train pipe burst in passenger service, what steps should be taken in regard to the car's position in the train?

A. c. A car with burst pipe must always be placed at the rear of the train and the hose connected to that of the car immediately preceding it, care being taken to close the stop cock on the front end of the disabled car, and to leave it open on the rear end of the car immediately preceding it. A brakeman with a full knowledge of the situation must invariably, in such cases, be stationed on the rear car.

Q. d. Is it objectionable to haul the rear car on a passenger train with the air cut out at the triple valve?

A. d. It is not objectionable to haul the rear car of a passenger train with the air cut out at the triple valve, providing the train pipe is open to the rear end, for the following reasons:

1. If the train should break in two immediately ahead of the rear car, the forward portion of the train would be automatically stopped before it could get far enough away from the rear car to cause any damage.

2. The train pipe being open to the rear of the train would allow the conductor to apply the train brakes from the rear car.

Q. e. Why should trainmen know the condition of the brakes under each car of a train fully equipped with air brakes, and especially on the rear car, before starting from terminals?

A. e. This is important for three reasons:

1. In order that the engineer may apply the brakes on all cars in the train from the engine.

2. In order that the conductor may apply the brakes on all cars from the last car in the train.

3. If the train should break in two, all brakes in working order will be automatically applied.

Mr. SCHROYER: In handling air brakes we require that the trainmen, both the conductor and the brakemen, shall advise the engineer when and where he is sliding wheels under his passenger equipment.

Mr. QUACKENBUSH: On our road trainmen are subject to suspension if they do not report to the engineer when he is sliding wheels.

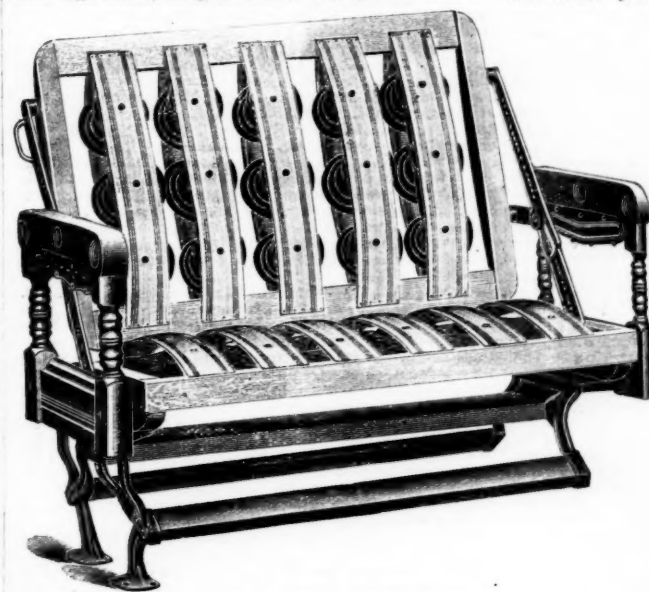
Mr. RHODES: We have no exact rules on that matter. We aim to have our trainmen report, but there is no discipline in case they neglect it. When we slide wheels we investigate the matter at once, and take it up with the engineer, and see whether it is through carelessness or otherwise, but we have no hard and fast practice.

Mr. BARR: We have a rule similar to the Northwestern. The trainmen are required to report all cases of wheels sliding that come under their observation to the engineer, and also by telegraph to the Division Superintendent at the nearest station to which they occur; and our way of holding trainmen and engineers responsible for sliding wheels is to make a monthly summary of the slid wheels which have come in, which are chargeable to the train crew in whose hands the train was when it was received. I find that that works very advantageously. The monthly statement is given to each of the Division Superintendents, and if a crew has too many slid wheels it is made a matter of discipline.

J. N. Barr, W. H. Marshall and W. H. Lewis were appointed a committee to draft resolutions of regret at the resignation of W. D. Crossman, the late Secretary.

Henry's Car Seat.

The accompanying cut shows Henry's new swing-back tilting seat with wood ends. It is also made with solid iron ends, and can be made with standard, high and extra high backs, using the same attachments.



Henry's Swing-Back Car Seat.

The cut shows the arrangement of the new all-metal springs. The back, instead of turning over, swings from front to back, thus bringing about the same wear on both sides of the back. It is manufactured by the Wakefield Rattan Co., of Boston, Mass.

The Sewall Steam Heating Coupler.

Figs. 1 and 2 show the latest form and construction of the Sewall coupler for steam heating hose on passenger trains. Most of our readers are familiar with the operation of coupling this device; it is simply a short move-

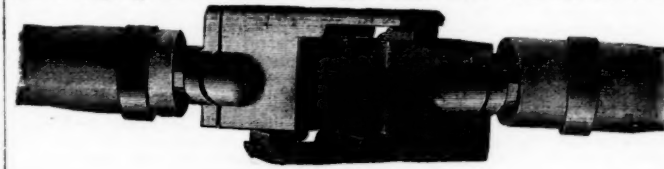


Fig. 1.

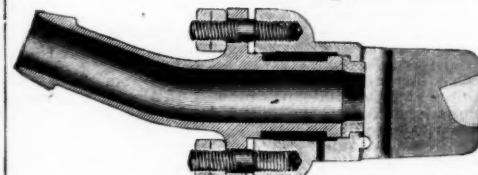


Fig. 2—Sewall Coupler—Section through Centre of Hose Connection.

ment in the downward direction. It automatically uncouples in a reverse direction when the cars separate. The internal construction is shown in fig. 2. The passage of steam is straight and unobstructed. All metallic parts are made of malleable iron, wrought iron or steel. The locking projections are so constructed as to draw the gaskets together in a direct line after contact. The gaskets are composed of peculiarly treated rubber, and have sufficient elasticity as well as strength to form a durable steam joint. The gasket is held on the inner face of the coupler head by the hose nipple, which in turn is held by studs and nuts shown in fig. 2. A new gasket can be readily put in place.

To reduce condensation the head is insulated by an air space completely surrounding the tube within the coupler head; this is one of the distinguishing features of the coupler. There are five parts—the head, the nipple, the gasket, the studs and nut. It is stated that the coupler

is in use on 88 different railroads in this country and Canada. It is sold by the Consolidated Car Heating Co., of Albany, N. Y.

The Evolution of the American Rolling Mill.

Capt. R. W. Hunt, retiring President American Society of Mechanical Engineers, chose for the subject of his address a historical review of the American Rolling Mill. The address is so valuable in matter and so admirable in style that we print it in full, merely omitting the introductory matter of transient interest. It is an important contribution to the literature of this great industry.

As the production of railroad bars or rails represents the largest volume of all the many manufactured forms of iron and steel, it is natural that we should first consider mills in which these are made.

First iron rail mills.—Iron rails were rolled from a pile composed of a number of bars of wrought iron placed one upon the other, brought to a welding heat in a furnace and then passed between the grooves of rolls, which welded them together, and gradually elongated and formed the mass into a finished rail. In the early days railroad engineers were not only satisfied to accept these rails cut in much shorter lengths than now prevail, but in fact, up to about 1850, would not receive them over 21 ft. long. Mr. James M. Swank in his "Iron in all Ages" states that the first rails 30 ft. in length were rolled by the Cambria Iron Co., in 1855, but there being no sale for them the rails were placed in the mill yard tracks. He also says the first 30-ft. rails rolled to fill an order were made by the Montour Co. in January, 1850, for the Sunbury & Erie Railroad Co. I am also indebted to Mr. Swank's work for most of the following dates in relation to the earlier rail mills.

The first American rail mill, that is one built to produce other than strap iron rails, was the Mount Savage Works, situated in Allegany County, Maryland, erected in 1843. Rolling began in 1844. Mr. Swank says that in honor of their first rail, which was of the U pattern, the Franklin Institute awarded a silver medal in October, 1844. The rail weighed 42 pounds per yard. Next came the Montour Works, at Danville, Pa. In October, 1845, in that mill was produced the first T rail made in America. In May, 1846, the Boston Iron Works, of Boston, Mass., began rolling rails. June 19, 1846, Cooper & Hewitt rolled their first T rail in their Trenton, N. J., mill. In September, 1846, the New England Iron Company, of Providence, Rhode Island, started rail making. In November of the same year the Phoenix Iron Company, of Phoenixville, Pa., rolled rails. In the fall of 1846 rails were made at Brady's Bend, Pa., by the Great Western Iron Co., in works built expressly for their manufacture. These works were very extensive, taking the ore and coal from adjacent property owned by the company, and by means of their own blast furnaces, etc., producing the finished product. About the same time the Lackawanna Iron & Coal Co., of Scranton, Pa., went into operation, producing rails from their own raw materials. Other mills were built, or remodeled to roll rails, until in 1850 there were some fifteen rail mills in the country, but the commercial conditions were such that the spring of that year saw but two of them in operation.

I have named these early rail mills as matter of history. Some of them are now makers of steel rails in new plants; others are producers of other finished forms of iron and steel; while still others have gone out of existence. In some cases scarcely a vestige remains of a one time great establishment. The mines are abandoned, the blast furnaces have but a few stones to mark their sites, and the rolling mills are so completely wiped out that not a trace of them remains. The once populous village of busy workers is now monumented by crumbling ruins of their homes. But not so the industry. The United States to day leads the world in her rail production. Our subject leads to the history of one of the survivors.

The Cambria Mills.—The Cambria Iron Works were built in Johnstown, Pa., in 1853, that location being selected because of an abundant iron ore and coal supply; these two minerals being deposited in the same hills and within a few yards of the selected blast furnace and rolling mill sites. The works were designed to produce iron rails alone. This particular locality had been somewhat exploited since 1800, with more failures than successes. The first iron works at Johnstown was a forge, built in 1800, on the banks of the Stony Creek, the waters of which were dammed to furnish power for its operations. A flood carried away this dam and led to the removal of the forge over to the banks of the Little Conemaugh, these two streams uniting at Johnstown and becoming the Conemaugh. When Mr. Swank made the chronicle, little did he or his readers dream of the greater flood which was to pour down the valley, to which this old forge had been moved for safety, and not only wipe out a large rolling mill plant but in addition cause the greatest disaster to life and property known to civilization.

The iron ore which had been used by the earlier establishments, and which led to the building of the Cambria Iron Works, was the outcropping of a silicious carbonate. The operations of the smaller plants had been more or less satisfactory, but the consumption of the greater works soon exhausted the outcrop and compelled the use of the leaner ore, which produced iron of an inferior quality. When puddled it was both red short and cold short. While the hardness incident to the latter gave good wearing rail heads, the red shortness rendered it difficult to obtain finished rails of which the flanges were not so badly cracked that they had to be thrown on the scrap heap. This happened even after passing through the elaborate system of patching and puttying

up cracks which then prevailed, and the entire absence of inspection bureaus.

The 3-high Roll Mill.—Up to July, 1857, all rails at Cambria and other mills were rolled on non-reversing 2-high trains of rolls. That is, there were but two rolls in a set, and as they were driven constantly in one direction, the metal which was being drawn into shape by their grooves could be rolled only in that direction. After each passage between the rolls, the pile, or bar, had to be passed back over the top roll, its revolution assisting in this. Of course quite as much time was consumed in this passing back as in the opposite rolling, or reductions. Not only was time consumed, and the amount of production limited, but the metal under treatment lost heat, and thus augmented the difficulties in obtaining satisfactory welds of the several slabs of iron composing the rail piles, and freedom from "red-short" cracks in the finished rail.

The difficulties at Cambria continued to increase, and, with no other available ore supply, were at last so serious that the prospects of the company were gloomy indeed. But as has so often and so fortunately happened, the difficulties and seeming hopelessness of the situation forced a solution of the particular case, and more than that, led to an invention which was destined to revolutionize the rail industry of the country.

Our esteemed fellow member, John Fritz, was then Chief Engineer of the Cambria Co. His keen mechanical perception and good judgment saw the solution of the problem. It was to save the time and heat lost in passing the bar back in idleness over the top roll; this could be done by adding another, or third roll, and so making that which had been the top a middle one. This top roll revolving in the opposite direction to the middle one permitted grooves to be added, in which the metal could be reduced as it was brought back to the front of the train of rolls. To accomplish this successfully, he invented the Fritz "Yielding Hanging Guides and Driven Feed Rollers."

This solution seems now a simple one. But we must remember that at the time of its conception rolling mills were considered old institutions, and their designers and managers thought themselves, and were thought by others, to be very smart men. Moreover, there were difficulties in the construction and operation of this proposed mill which would appear only to those possessed of some practical knowledge. Indeed, some of those high in the councils of the Cambria Co. entered solemn and official protests against that crazy man, Fritz, being permitted to waste the company's money. His affairs were badly enough off as it was without adding this foolishness. In addition, some of Mr. Fritz's brother engineers and intimate friends compelled themselves, as a matter of fraternal duty, to labor with him against his folly, and thus prevent his scattering to the winds his most excellent and hard-earned reputation. In spite of all, he had the courage of his convictions, and the new mill was built. Let me tell of its start in his own words:

"The 3-high mill was started on Wednesday, July 29, 1857. We charged and heated six rail piles. We rolled three of them, making perfect rails, when the eccentric of the rail mill engine became hot and bent the rod badly. Having tried the mill, and all gone perfectly, we stopped, resuming work on Friday morning, and continuing regularly until the usual quitting time on Saturday afternoon. Mr. Alexander Hamilton, then and now the Superintendent of the mill, and I left the works about half past five in the evening, congratulating ourselves that our troubles, so far as the rail mill was concerned, were practically ended. About seven o'clock that night I heard the mill whistle blow for fire, and at once started for the works, to find the mill in flames from one end to the other. In less than an hour's time the whole structure was consumed. I will leave you to imagine how I felt while seeing in one short hour our best efforts and the labor of a whole year destroyed. But we went at it again, and in about one month's time were again making rails. As almost every person who was supposed to know anything about rolling mills had predicted a failure, the story got out that we had tried the mill, and finding it a failure, had burned the whole thing down to hide the blunder."

I doubt if ever during Mr. Fritz's subsequent eventful life he has had to carry quite as heavy a mental load. Since then mighty works have grown from his designs, and under his charge. Millions of dollars have been invested on his judgment. The monster steam hammer of the world is his creation, but I venture that while waiting for the shock of its first 125 ton blow, his anxiety was but as that of a child compared to that felt while the first rail pile was passing between the rolls of his 1857 mill.

In designing and perfecting this mill Mr. Fritz was assisted by his brother George, who, upon John's resignation from the Cambria Co. in 1860, to organize the Bethlehem Iron Co. and design and build its works at Bethlehem, Pa., succeeded to his position as Chief Engineer of the Cambria Co.

The Fritz mill was rapidly adopted by the rail mills of the country. Mr. Fritz protected himself by patents, which were soon acquired by a combination representing the larger rail mill organizations, under the title of John M. Kennedy & Co., of Philadelphia. In 1864 and 1866 I made in their interest a tour of inspection of all the rail mills of the United States, and found the Fritz mill in universal use. Some had not secured proper licenses, but I believe all ultimately settled.

Early Steel Mills.—I have already placed upon record (lecture before the Franklin Institute, Philadelphia, Jan. 21, 1883), that the first commercial rolling of steel rails was at the Cambria works in August, 1857, on an order from the Pennsylvania R. R. Co. from steel made by the Pennsylvania Steel Co. at their Steelton plant. These rails were rolled on a 3-high 21-in. train, on which the heavier sections of iron rails had been rolled. At first the steel ingots were drawn into blooms under steam hammers. Mr. George Fritz concluded, as stated by me in the "History of the Bessemer Manufacture in America" (Transactions American Institute of Mining Engineers, Vol. V.), that this was not the proper manner of treating the mineral. He had blooming rolls prepared, and placed in one set of the 21-in. rail train hangers. A. L. Holley was then in charge of the Pennsylvania Steel Works, and sustaining Mr. Fritz in his experiments, had ingots 8½ in. square cast, and sent to him. These were bloomed by the rolls to 6½ in. square; reheated in the heating furnaces; wash-heated, and then rolled into rails. This practice was successful, and I believe this was the first cogging, or blooming mill.

In 1868 Mr. Holley relinquished the management of the Pennsylvania Steel Works, and later in the year again took charge of the Troy Bessemer Works, which he had originally built. In January, 1871, he started a 30-in. three-high blooming train, provided, front and back, with lifting-tables, containing loose rollers, and raised by hydraulic power. The rolls were turned to receive 12 in. square ingots, which were cast heavy enough

to make two rail blooms. These ingots, after being placed on the loose rollers of the front table, were pushed into the rolls, both on the front and back sides, by hand; it requiring eight men to operate the mill. This train had the top and bottom rolls stationary. The middle roll was moved up and down by four screws running through the bolsters carrying its necks; these screws being rotated by a friction clutch, which was driven by a belt off the main shaft of the engine driving the train, and controlled by a hand lever at the end of the rolls. There were four grooves in each roll, and by the travel of the middle roll the possible reductions were increased. The mill worked well and was a great advance in the art.

The Fritz Blooming Mill.—On July 10, 1871, the Bessemer Works of the Cambria Iron Co. made their first blow, the steel from which was rolled in a blooming train, designed and built by George Fritz. As I have previously recorded, he and Holley were close personal and professional friends, and their interchange of ideas and mutual assistance was frank and full. Fritz was an ardent admirer of Holley, but he could not simply copy any man; hence, while cheerfully giving Holley credit for everything taken from him, he introduced many new ideas in his arrangement of the Bessemer plant and blooming train. In the latter he made the middle roll stationary, and moved the top and bottom ones, thus saving time in setting the passes; and as distinctively new and important features, he arranged to drive the rollers in the tables by means of gears, controlled by friction clutches, deriving their power from the train engine. He also invented a hydraulic pusher, working between the rollers, for turning over and moving the ingots on the tables. These last two features constituted the Fritz blooming mill patent. By these improvements the mill force required was reduced to four men. In 1876 I wrote: "The merits of rolling as compared with hammering had been fully discussed between Mr. Fritz and Mr. Holley, and they had, at various times, gone over the numerous details of a blooming mill, and Mr. Holley, as already stated, had built one at the Troy works. Mr. Fritz had availed himself of the benefit of the extensive knowledge and sound judgment of his brother, Mr. John Fritz, of Bethlehem, Pa., and the result of all was the Johnstown Blooming Mill, which marked a new era in the Bessemer manufacture. While living to see many difficulties overcome and great progress made, George Fritz died too soon, his country losing one of her noblest and ablest sons. He died Aug. 5, 1873."

In Oct., 1873, the works of the Bethlehem Iron Co., of Bethlehem, Pa., began operations, having been designed and built by Mr. John Fritz, Mr. Holley being connected with him as consulting engineer. Mr. Fritz made an important improvement in his blooming mill in dispensing with the friction arrangement for driving the table rollers by putting in a pair of small reversing engines, the power being transmitted through a belt. Holley soon improved on this by using an intermediate gear in place of the belt.

Of course many improvements have been made in the later blooming mills; in fact, Mr. Fritz himself soon built another one, in which he made the rolls heavier and longer, thus being enabled to add another groove, which allowed making all three rolls stationary.

It must not be supposed that the innovation of rolling ingots into blooms was received without dissent. In fact, the "Transactions of the American Institute of Mining Engineers," as well as the files of some of the technical newspapers, record animated discussions in which the advocates of hammering sought to prove that good and uniform results could not be obtained by rolling. But the tide could not be turned back and about all the rail steel of the world has been bloomed in rolling mills for many years.

It has always been a little dangerous to say "can't" in connection with the Bessemer manufacture. As an instance of the prejudice against rails rolled from blooms other than those which had been produced by hammering, and the deep amount of knowledge of the business which then prevailed, I recall that it was thought necessary by the Cambria management, at whose mill hammering had been abolished, to invite J. Edgar Thomson (then the President of the Pennsylvania Railroad, and I believe the first American railroad president to recognize the merits of steel rails) to visit their works, where they were filling a steel rail order for his road, and witness some drop tests of rails which it was hoped would convince him that even if hammering the ingots ordinarily gave better results than all rolling, the system of bottom casting the ingots then practiced at the works gave such superior steel, that their resulting rails were equal to any in the manufacture of which hammering had played a part.

Mr. Thomson made the visit, had the theory explained to him, witnessed the tests, seemed satisfied—at all events did not talk back—and every one was happy. While those drop tests were being made how some of us did tremble from fear that one or more might break; but luck was on our side that day.

Some Early Bessemer Plants.—In 1868, the Freedom Iron & Steel Co., with works near Lewistown, Pa., started operations in a plant of almost entirely imported English machinery. In fact the Bessemer blowing engine, which was built by Messrs. I. P. Morris & Towne of Philadelphia, was the only item of any importance of American construction. The company's original intention was the manufacture of Bessemer steel plates and tires. They put in a reversing plate mill, driven by a reversing Ramsbottom engine. This was soon changed to a rail mill, and was the first reversing rail mill in America. The works were not successful, continuing in operation but about one year. The Bessemer machinery was sold later to the Joliet Iron & Steel Co., of Joliet, Ill. Later still the Cambria Iron Co., purchased the rail mill and engine, and set it up at Johnstown as a blooming mill, in place of the original Fritz mill, which was too light to handle the 18 in. square ingots they desired to cast. The Freedom mill is still in existence, but the Cambria Co. have built another, also of the two high, reversing type. The English tire rolling mill at Freedom was a fine tool, and became the property of the Standard Steel Co., who operated it in the original location; rolling Open-Heart steel made by the Otis Co., of Cleveland, O.

In August, 1881, the Pittsburgh Bessemer Works at Homestead, Pa., started. In their construction it was sought to keep clear of all patents controlled by the Bessemer Association. I presume this, together with their desire to produce billets and slabs of various sizes, led to the adoption of a two-high reversing blooming mill, designed and constructed by Mackintosh, Hemphill & Co., Limited, of Pittsburgh, Pa. This was the first complete mill of that type of American construction, but in 1879 Messrs. Schoenberger & Co., of Pittsburgh, had experimented with their reversing blooming mill, and later Andrew Kroman had put in such a mill for rolling eyebars at his Superior mill. Experience gained from these guided the firm named to designing the Homestead

mill. These works are now part of Messrs. Carnegie, Phipps & Co.'s Homestead Plant.

The South Chicago Bessemer plant and rail mill of the North Chicago Rolling Mill Company, went into operation in June, 1882. This mill was designed by Henry C. Kriete (since deceased), the mechanical engineer of the company, and most of the machinery was built in their own shops. Mr. Kriete adopted a Fritz blooming mill, but a reversing two-high rail mill; this being the first reversing rail mill built in the country.

In May, 1883, the Scranton Steel Company of Scranton, Pa., started. Their works were designed under the personal direction of W. W. Scranton, president of the company. He imported from England both reversing blooming and rail mills, and their engines.

It is needless to say that during the time covered many changes had been made in the various mills of the country, and none were exact copies of any other; each engineer seeking to improve on previous construction, and generally succeeding. But while there were many changes in the details, the general plans of the three-high blooming and rail mills remained the same.

Rail curving machines.—In the early days of iron rail making, the only means of cold straightening the product was by the blows of a heavy sledge. In fact, I think it was not until about 1853 or 1857 that a straightening press was employed. It is needless to say that the sledge process was slow and would have been inefficient on heavier sectioned rails of either iron or steel. After the introduction of the cold straightening press, the hot bed remained as a weak spot. The rails had to be hot curved against their heads, and to do this by hand and then drag them down the hot beds by the same power was both slow and exhausting work. The several mill managements devised various plans to dispense with as much labor as possible in handling the rails, from the time they left the finishing pass in the rolls until delivered on the cooling beds. In many mills this was successfully accomplished up to the hot curving. At that point there was a long halt.

In 1875 A. J. Gustin, then the Superintendent of the St. Albans, Vt., rail mill, invented a rail curving machine, which together with power appliances for dragging the curved rails down the hot bed he patented. These devices were soon adopted by many mills. Later, Mr. William Clark, of Pittsburgh, invented a rail curver, which many prefer to the Gustin. Some mills have adhered to arrangements of their own, but the Gustin and Clark devices may be accepted as the American practice. Without some such arrangements the increase of product, which has been so great, would have been an impossibility.

Automatic Devices.—Even before the introduction of steel rails, a number of inventors had sought to design rail mills which would be practically automatic in their action, but I believe down to the time to which we have traced the art, none were actually built. Holley used to say, in that spirit of prophetic jest, so constant with him: "That the day would come when we would start a rail mill on Monday morning, and then go home after locking the doors; only returning each morning to count the rails that had been made during the preceding 24 hours; no other manual labor being necessary." We have not yet reached that point, but how some of us have mourned that he could not have been spared to see, and glory with us in what we have accomplished! He knew it could be done, but for some incomprehensible reason, the way did not open to his mind.

In March, 1884, I introduced driven tables in front of the finishing rolls of the rail train of the Albany & Rensselaer Iron & Steel Co., of Troy, N. Y. They worked so well that, assisted by Max N. Suppes, then the Master Mechanic of that department, I put an automatic arrangement in front of the roughing rolls. This also was successful. Of course we protected ourselves by letters patent. Later I placed tables on the catchers' side of the train. Capt. Wm. R. Jones, then the General Superintendent of the Edgar Thomson Works of Carnegie Bros. & Co., at Bessemer, Pa., at once advised his firm to secure authority from me to use my patents. As he proposed a different arrangement for the roughing rolls, he did not care for the Hunt-Suppes claim. The arrangement having been consummated, he constructed an elaborate system of tables, both front and back, all of which he subsequently patented, and we joined interests in them. As an instance among many of his great heart, he wanted to give me the whole thing, saying: "You were the first to put this matter in a practical shape, and deserve it. I have only gone further with your ideas." Of course I did not accept his proposition, and I know it was to his regret.

Captain Jones.—Fate sometimes seems too hard to be just. That my friend should have been cut off in the middle of his great life work, and by such a death, was one of those catastrophes the justice of which is beyond human comprehension. Yet I believe he died as he would have chosen—foremost in danger. Often had he risked his life amid shot and shell, and where his example was the incentive to others for higher daring. He escaped hurt or death on the battlefield, but yet to die at what he thought the post of duty. An ardent admirer of Captain Jones, and whose own soldier life had given him a closer sympathy, said, when he heard the details of the accident: "Another General shot on the picket line." This was true; but those who know the history of that fateful afternoon appreciate why he could not be content save at the very front. I know he said to himself: "This company has trusted me; has to-day shown that they appreciate and love me. Their losses are mine, and until I know that furnace is safe I cannot go home." It meant his death; but to him better that than the suspicion of want of devotion. And was he not right? It must come. Better let it find duty overdone than ever so slightly shirked. Please excuse my digressing while paying this poor tribute to Captain Jones' memory. It deserves more than I have said. Such men have made, have saved, and will continue to be, our nation.

Automatic Devices.—Before the introduction of automatic appliances, from 15 to 17 men were required to operate a three-high rail train. The tables of which I have spoken reduced this number to five, including the ruler in charge of the train. The next mill to put in automatic tables was the Pennsylvania Steel Co., at Steelton, Pa., in 1884, under licenses from Mr. Suppes and myself.

The Joliet Steel Co., at Joliet, Ill., had been experimenting for some time with a large sized working model of an automatic rail mill, from designs of H. S. Smith, General Manager; Charles Pettigrew, Chief Engineer, and Mr. F. H. Treat, the latter gentleman being especially engaged upon them. In July, 1885, they altered their blooming and rail mill to conform to the plan, which proved to work as well in actual practice as in experiment. They kept clear of the Jones, Suppes & Hunt patents, except in one particular, and for this they have since taken a license. For some time this mill has been rolling more billets than rails, the practice being to reduce a 15 in. ingot to 4 in. billets at one heat.

The product has been brought up to 500 gross tons of such billets per turn, and 1,000 tons per day.

The Union Steel Co. was reorganized in 1885, after the failure of some years before, and the Bessemer works, blooming and rail mills were completely rebuilt by our fellow-member, Mr. Robert Forsyth. While his company secured licenses from our party, he made radical changes in the arrangement of his tables, and, though hampered for want of room, with great success. The new mill started in 1886. He arranged his mill to avoid reheating the rail blooms, although they had to be carried a long distance on driven rollers, from the blooming mill to the rail mill tables, and make two right angle turns in the journey. The Union Mill's best record on standard sectioned rails is, for 24 hours, 1,312 gross tons; for month, 28,490 gross tons of rails.

In the same year, Cambria remodeled the mill on which the first commercial American steel rails were rolled, and put in automatic tables designed by Mr. Joseph Morgan, Jr., a member of our society. This company has since taken licenses from Jones, Suppes & Hunt.

In 1887 the Worcester Steel Co., of Worcester, Mass., made terms with us, and added tables to their rail train, which were designed by Mr. C. M. Ryder.

The Edgar Thomson Mill had been doing great work, but neither Captain Jones nor his superior officers were satisfied with being so closely pressed in the amount of rails produced by the Union Works, the South Chicago Works and the Scranton Steel Co. Instructions were given to him to build the best rail mill he knew how, regardless of cost. This order was obeyed in every particular, and resulted in the present Edgar Thomson Blooming and Rail Mills. The first rails were rolled in the new mill early in 1888. Since then the old mill has been idle.

In designing his new mill Captain Jones made some radical departures. He adhered to the reheating of the blooms after leaving the blooming mill, but caused them to pass through heating furnaces on their road to the rail train. This train he divided into three sets; the first two with three-high rolls; the last with two; all of 24-in. pitch; each set being driven by its own engine, and provided with automatic tables. In the first, or roughing rolls, five passes are made. The bloom is then carried by driven rollers to the second or intermediate train, in which it receives five more passes, and it is then carried to and through the finishing pass in the two-high set. These trains are placed in echelon, and far enough apart to permit three 30 ft. rails to be rolled. The mill is a very simple one, and has many mechanical arrangements which make roll changing the work of but a few minutes; while every part of each set of rolls is easy of access. After the rails leave the cambering machine, they are carried down the hot bed by power, and automatically distributed to the cold straightening presses. This arrangement is simple, substantial and inexpensive of operation. Since Captain Jones' death some changes have been made, but none of a radical character, and some of them had been foreseen by him. The best product of this mill has been 781 gross tons of rails in 12 hours; 1,558 gross tons in 24 hours, and 33,181 gross tons in one month.

In 1886 the Indianapolis Rolling Mill Co., of Indianapolis, Ind., added an open hearth steel plant to their works, and spent considerable money in remodeling their rail mill, and among other things adopted automatic devices for handling the material at the rolls. This was done under the charge of and from plans of Mr. D. L. Lentz. The mill worked very well, but commercial reasons soon caused rail rolling to be abandoned, and it has never been resumed.

Street Rail Mills.—The great progress made in the introduction of street car roads, and the increased weight of rolling stock required for the cable and electric systems, as well as the requirements by municipal governments that the intermediate pavement, as well as that outside of the rails, should be of good character, led to the invention of the girder street car rail. The first to secure recognition was the invention of Mr. T. L. Johnson, of Cleveland, O. These were for some time rolled by the Cambria Co., but the demand increased so rapidly that Mr. Johnson's company decided to build a mill of its own. This was done under the direction and from the plans of Mr. A. J. Moxham, the President of the Johnson Co. The mill was located at Moxham, near Johnstown, Pa., and commenced rolling in 1888. Owing to the extremely difficult character of the proposed sections, Mr. Moxham decided upon an English, two-high reversing mill, importing his engines and train. I think he was wise in his selection of type of mill, as in such a one the piece can be entered while the rolls are revolving very slowly; and if such entry is not satisfactory, the mill can be reversed at once, and the piece backed out. At all events the works have been very successful. But it must be not inferred that such sections cannot be rolled on three-high trains, because it has been, and is being done; this at the "Old Mill" of the Cambria Co., the Tidewater Steel Co.'s Chester, Pa., plant; the North Chicago Mills of the Illinois Steel Co., and notably by the North Branch Steel Co., of Danville, Pa.

The Duquesne Steel Co., of Pittsburgh, was organized, and located works at Oliver on the Monongahela River, some 14 miles above the city, and about two miles above and on the opposite side of the river to the Edgar Thomson works. After building a converting and reversing blooming mill plant, operations were suspended. Late in 1887, or early in 1888, a new company was formed under the name of the Allegheny Bessemer Co., and the partially built works were completed by the addition of a three-high rail mill. This was built by Mackintosh, Hemphill & Co., Limited, under license secured from the parties controlling the Joliet table patents, and from the designs of Mr. William Clark, of Pittsburgh, who was interested in the new company. This mill was composed of two trains of rolls, standing one in front of the other, and back of the blooming mill. Each train had two sets of rolls, and was driven by its own engine. Good work was accomplished, but neither the converting works nor blooming mill was able to furnish steel enough to test its capacity. Messrs. Carnegie, Phipps & Co. have since acquired the works, which are now principally devoted to making blooms and billets.

The Latest Mills.—After the consolidation of the Joliet, Union and North Chicago Cos. into the Illinois Steel Co., it was decided by the new organization to dismantle their two-high reversing rail mill at the South Chicago works, and replace it by a three-high mill with automatic tables, again taking license from us. Mr. Forsyth had become the Chief Engineer of the new company, and built this new mill. In its arrangement and construction he again made changes from anything which had gone before, and his results are speaking loudly for themselves. He divided his rail train into two sections, somewhat like the Allegheny Bessemer works, each having two sets of rolls in three-high housings, and each sec-

tion driven by its own engine, with automatic tables front and back of the rolls. These trains stand in echelon with the blooming mill, which is a 40-in. three-high train. The rail mill rolls are 27-in. pitch.

In the practice of this mill, as at the Union, the ingots are kept, after being cast, in a perpendicular position; they are charged upright in gas fired soaking pit furnaces of the Hainsworth type, but which are of Mr. Forsyth's own design. After the ingot is reduced in the blooming mill, it is carried by power rollers toward the first rail train and through a shear, by which the end, which was the top of the ingot, is cut off and the long bloom sheared in two, each half making two or three rails, according to weight of intended section. The first half at once passes through the rail roughing rolls, the second one being held for a few seconds, or until the first has made three passes, when it is also sent forward.

If from any reason the bloom when sheared should have become too cold to be safely and successfully finished, a power overhead traveler is provided to carry it at a right angle into a wing at the side of the mill in which heating furnaces are located, with a Wellman charging and drawing crane in front of them. When sufficiently heated the same tool conveys the steel back to the table rollers. By this arrangement cold cobbles, or other rail blooms, can be heated and delivered to the rolls. In the roughing rolls the bloom receives five passes in three-high rolls. It is then passed to the second roughing tables, and is given three passes in three-high rolls. The partially formed section is elevated to the back tables of two-high rolls, and making one pass through them reaches a dummy table in front, from which it slides down to driven rollers and is by them carried back to the three-high set of rolls, which are in line with the first roughing rolls and driven by the same engine. In these it receives four passes, making in all 13 rail mill passes. It is now a finished section, long enough to cut into three 30 ft. rails. This is done at one operation by four saws. After passing through the cambering machine, the rails are carried by power down the hot beds. When sufficiently cool, they are loaded by power on a spider car, which is handled by a special locomotive. The rails are conveyed to the several cold beds, located conveniently to the cold straightening presses, and are unloaded on to these beds by an automatic arrangement of arms, or levers, receiving their power from steam taken from the locomotive boiler.

Up to date the best record of the South Chicago Works on standard rail sections is: In 12 hours, 845 gross tons of rails; 24 hours, 1,571 gross tons; week, 8,152 gross tons; month, 34,381 gross tons.

Owing to the depression in the rail market the Union Works of the Illinois Steel Co. have not been running steadily for some time, but on Oct. 30, 1891, the mill was rolling light sectioned rails, weighing 35 lbs. per yard, and by way of keeping their South Chicago friends from forgetting their existence they took occasion to make a record on such work. The rails were rolled direct from 15-in. ingots, without reheating, and the result was: Day turn, 3,238 rails; night turn, 3,069, making 6,357 rails for the 24 hours, and weighing 989 gross tons. Three hours and 28 minutes out of the 24 were lost from various causes, such as changing passes, dressing rolls, &c. As might be expected, South Chicago soon sought revenge by rolling 3,540 rails of 40 lb. section in 12 hours. These were also rolled direct from 15-in. ingots.

The last American rail mill to join the sisterhood was the Sparrow's Point plant of the Maryland Steel Co.; a very near connection of the Pennsylvania Steel Co. These works are situated on the Patapsco River, a few miles from Baltimore, Md. They are not yet fully finished, but are designed to be among the best, if not the best, in the country. F. W. Wood, President and General Manager of the company, and also the General Manager of the Pennsylvania Steel Co., designed them, and he has spared neither money nor brains.

The blooming mill is a two-high reversing one, built by Messrs. Mackintosh, Hemphill & Co., Limited. The rail mill is three-high, and consists of three sets of 27-in. rolls standing in line with a Porter-Allen engine at each end of the train. Either engine is calculated to have power enough to do all the work, but it is intended to employ both: The rolls have automatic tables, and the work is transferred sideways, as in the earlier mills. It is expected to roll long lengths.

The Lackawanna Iron & Steel Co. have acquired licenses to use the Jones, Suppes and Hunt patents, and I believe, propose to put automatic tables in their upper works at an early day.

Cold Rolling of Iron.—I come now to speak of what may more appropriately be termed a process, because the accomplishment was reached without a special mill. Of course the metal of the rolls, and the grooves in them had to be of special character, but the work was done on an ordinary merchant bar mill. I refer to the cold rolling of iron. This was invented by Mr. Bernard Lauth in 1859. His patent was dated Aug. 23 of that year, and the process became a distinctly American one. Messrs. Jones & Laughlin, of Pittsburgh, Pa., acquired the sole control in this country, and derived fame and fortune from it. While a great deal of cold rolled iron shafting and other articles is still used, the cheapening of steel has caused that metal to largely replace iron, and its greater stiffness has rendered unnecessary its being cold rolled for most purposes.

In 1864, Mr. Lauth patented another invention, and that was the three-high plate mill, with the diameter of the middle roll much smaller than the other two. Much of what I have said in favor of the three-high rail mill applies to this type of plate mill, and it soon became the American mill, and was also largely adopted in other countries. Mr. Lauth has been a constant experimenter, and has made many rolling mill improvements of great originality and value. His name must always rank high among those who made successful the iron and steel industry of his country.

Plate Mills.—American plate mills have developed in many points, as the greater requirements of steel made more powerful trains a necessity. The plant of the Oris Steel Company, of Cleveland, O., designed and built by our fellow member, S. T. Wellman, in 1873-74, and started in 1875, afterward added to and improved by him, was for a long time the most complete one in the country. The increasing demand for steel plates, also for armor and other heavy plates, has led to the building of other large mills, notably by Messrs. Park Bros. & Co., Shoenberger & Co., Linden Steel Company, Spang Steel & Iron Co., etc., of Pittsburgh, and particularly Messrs. Carnegie, Phipps & Co., of the same city. The latter works possess some powerful mills, which have been lately increased.

The universal mill has been largely employed in America, but while the original designs have been added to, I think Wagner, of Austria, deserves credit as the original inventor. Mr. Charles Hewitt, since deceased, designed and built for his firm, Messrs. Cooper, Hewitt & Co. of Trenton, N. J., a beam mill on the uni-

versal principle, which was a radical departure from all previous plans.

Wire Mills.—Previous to 1869 all wire rods were rolled in this country upon ordinary guide mills, the manipulation of the material being entirely by hand. Billets of about 1½ in. square and 18 lbs. in weight were used, and six tons of No. 4 rods was regarded as a good day's, or turn's, work.

In the spring of 1869 the Washburn & Moen Manufacturing Co., of Worcester, Mass., put in a continuous wire rod mill, after the design and patents of Mr. George Bedson, of Manchester, England. On this mill 1½-in. billets were used, but weighing 80 lbs. each; and without any manual labor rolled to No. 6 rods. Seven tons of these was considered a satisfactory day's work. Our fellow member, Mr. C. H. Morgan, was in charge of the Washburn & Moen works, and he soon discovered that the production of the continuous mill was limited by the reel upon which the rods were coiled as they came from the rolls, this reel being operated by hand. He put in a power reel, and was soon enabled to bring the production of the mill to over twenty tons per turn.

A few years later the Messrs. Roebling, of Trenton, N. J., following a Belgian practice, built a rod mill composed of two separate trains of rolls; the first, or roughing rolls, being of the largest diameter and driven direct from the engine shaft, while the second, or rod rolls, were placed some 30 ft. back of the roughing and driven by belt at a much higher speed. This arrangement was much superior to the ordinary mill, but did not dispense with any labor. The Trenton Iron Co. of Trenton, N. J., and Washburn & Moen also put in Belgian trains. The Roeblings and the Trenton Iron Co. have both greatly improved their mills.

In 1876 the Cambria Iron Co. built a rod mill after the designs of Henry B. Comer. While all the rolls of this train were in a continuous line they were divided into groups, each succeeding one of which was driven at an increased speed by a line of shafting placed directly under the train. This mill has since been altered and improved.

Mr. C. H. Morgan constructed another continuous mill for Washburn & Moen, in which many improvements were made, and since he severed his connection with the company the good work has gone on. Rods are now finished on the mill at a speed of 50 ft. per second, and reeled with ease and certainty.

Mr. Morgan built in 1888 a continuous mill for the American Wire Co., of Cleveland, O., on which over 118 gross tons of No. 5 rods have been rolled in ten hours, through a single groove or pass. They have rolled 500 tons per week of No. 8 rod for three consecutive weeks. On the same mill a production of 3½ tons per turn for two weeks of No. 9 rods, 148 in. diameter, rolled from billets weighing 210 pounds, has been reached. This was a reduction of area of 99.89 per cent. The finished rods were 3,620 ft. long.

In 1882 Mr. William Garrett, a member of our society, then Superintendent of the merchant mill department of the Cleveland Rolling Mill Co., Cleveland, O., patented and built a mill which was destined to play a conspicuous part in the American wire industry. The continuous mills were using 1½-in. billets; the Belgian mills 2-in. ones. To produce billets of these sizes, it was then necessary to roll the steel ingot to blooms, reheat the blooms and roll to billets. Mr. Garrett's desire was to construct a mill which would take a billet of a large enough section to permit its being rolled direct from the ingot without any reheating. He settled upon 4 in. square as being that size. To accomplish this, he went beyond the Belgian mill by putting in three separate trains of rolls, placed in echelon, and driven at progressively increasing speeds. Hence the billet rolls could run at a comfortable speed for the workmen to handle the billets without interfering with the speed of the finishing trains. This arrangement not only permitted the use of the larger billet, but made it possible to have several distinct pieces in the rolls at the same time. The present practice is four pieces, and sometimes five rods will be reeled off simultaneously. Since the Cleveland mill, several other works have put in the Garrett mills, and he has sought to make each last the best.

In all forms of mills, excepting the continuous, advantage has been taken of the device known as the "repeater." This was first patented by John Davis, of Cleveland, O. A later one was invented by Mr. McCallup, of Columbus, O., and the last, and by many thought the best, one was invented by Frank G. Tallman, member of this society. By turning the piece from one pass to another, the repeater saves a large amount of labor. On one of the Garrett mills 140 gross tons of No. 5 rods have been made in 10 hours, 1,300 tons in a week and nearly 5,500 tons in a month. While the advocates of the continuous system admit that greater product can be obtained on the Garrett, they claim a saving in labor and in loss by oxidation. For the average of three years' work I am given the loss on weight from billets used to finished product on a continuous mill as 2.08 per cent. If there were no differences of opinion and professional and commercial rivalries, we should be without progress.

Tire Mills.—Among the radical manufacturing departures in rolling mills, I would mention the Munton Tire mill, which is in successful operation at the works of the Chicago Tire & Spring Co., at Melrose, near Chicago. The process which this mill makes possible and the mill itself are the inventions of Mr. James Munton, the Superintendent of the works. He entirely dispenses with hammering in making locomotive or other steel tires. This by the following practice: The ingot is cast with a hole cored out large enough to admit a small roll. The ingot is heated and taken to the rolling mill, where its top, with its imperfections, is sheared off by the rolls, and the bloom left of a given weight. At the same heat and by the same operation the bloom is also roughed out by the roughing rolls of the mill and edged down by horizontal rolls. The bloom is reheated and placed in the tire rolling mill, where it is rolled and finished to the exact inside and outside diameter required. Mr. Munton's mill is so constructed that on it a bloom can be "rolled back" to a smaller diameter. This also applies to a finished tire.

Another tire mill embracing several new features, and of great power, is the one designed and built for the Latrobe Steel Co., Latrobe, Pa., by Julian Kennedy, their Chief Engineer. The other American steel tire makers are the Midvale Steel Co., of Philadelphia, Pa., and the Standard Co. already mentioned.

During the years of the rolling mill history which I have sought to sketch, there have been many improvements made in the construction of all forms of mills, and many sections have been successfully produced on them which were previously thought impossible. I have not attempted to enumerate all of these, but have sought to confine myself to those which have been distinct departures in the rail trains. I have done so because, while many things and men deserve mention, the time required would have gone far beyond the possibilities of this occasion. I will, therefore, close with a reference

to the latest radical departure, which, while not yet quite a commercial success, still has been placed in a sufficiently prominent position to deserve record. I refer to the rolling of liquid steel by Mr. Edwin Norton, at the works of Norton Brothers in Chicago.

Rolling Fluid Steel.—It has been known for some time that Mr. Norton was experimenting in this direction, and in fact had taken out patents in this and other countries. The paper read by Sir Henry Bessemer at the late meeting of the Iron & Steel Institute on "Rolling Fluid Metal," and which has already been published in several of our technical papers, has called renewed attention to this system of producing steel sheets for tinning. The commercial changes in the tin-plate industry have been somewhat violent of late, and appearances indicate that the location of a large part of the manufacture may come to this country. At all events, changes which will cheapen the production have become necessary, no matter where the plates are made. The Messrs. Norton are the largest individual tin plate consumers in America, and as such have naturally kept fully in touch with all phases of the trade. Mr. Edwin Norton is the mechanical member of the firm. Some years ago he fully perfected the rolling of soft metals direct from the liquid state into finished sizes. He was fully posted as to what had been attempted in the years past in such rolling. His success with soft metal led him to go farther and strive to do the same thing with liquid steel. He had encouraging results. He protected himself by patents at home and abroad. He felt full reverence for all that Bessemer had given the world, and knew that some 30-odd years ago he had experimented with this very process, and thought he knew wherein Bessemer had not gone quite far enough to insure complete and uniform success. Still, he felt that he deserved recognition. Moreover, Mr. Norton, as a successful American, duly appreciated the advantages which would naturally accrue from having Bessemer endorse and become interested in his process. For these reasons, after protecting himself by patents, he wrote Sir Henry Bessemer, also sending him a piece of sheet which he had rolled direct from liquid metal; explained what improvements he had made, and proposed an honorable commercial relationship. Certainly there was nothing disrespectful in this, no matter how great the man to whom it was made.

Now, mind you, up to this time Bessemer seems to have attached little importance to his experiments of many years ago. Messrs. McKinley and Norton recalled them to his mind, and gave them value. Perhaps this is none of my business, but Sir Henry has aroused my American ire. He says: "I received, about two years ago, a parcel from America containing a small sample of sheet metal, which was being successfully manufactured there. The person from whom I received it informed me that it was made by a slight alteration or improvement on my patent of 1857, for rolling continuous sheets and thin bars of iron or steel direct from fluid metal. He offered me one-half of his patent if I would undertake its introduction into this country. I did not accept his offer, and there the matter rested."

"The circumstance stated has, however, afforded me an opportunity of showing you a small sample of a continuous sheet, produced direct from fluid metal at a single operation, and proves beyond doubt or question the important fact that fluid metal may be chilled and formed into a continuous sheet between rolls that are kept cold, while it well illustrates the spirit of enterprise of our American cousins, who are so prompt to recognize, to adopt and to improve upon the inventions brought forward in Europe."

I think he might have treated Mr. Norton a little less cavalierly without any prejudice to his great fame. This thing had lain dead all these years. Should not some honor be given the man who was able to put life into the corpse, and conquer for it a place among live industries? The greatest have always been under obligations to others for portions of their triumphs, and always will be. The Bessemer process was a failure for all but the higher purposes until Mushet's invention, and while Sir Henry honored himself by settling an annuity upon Mushet, who at that time had made nothing from his invention, still I for one would have had my already profound respect increased if Bessemer had even mentioned Mushet's name in his letter, giving the history of his process, which was read at the Pittsburgh, Pa., meeting of the Iron & Steel Institute. We honor you, Sir Henry, and are proud to have your portrait hanging upon the walls of our society house, and hanging in company with that beloved departed member who did so much to create our organization, and so much to add to your great fame, but I am not willing that you should have all the credit for the last development in American rolling mills.

The Twenty-Fourth Meeting of the American Society of Mechanical Engineers.

The American Society of Mechanical Engineers convened at the home of the Society, No. 12 West Thirty-first street, New York City, on Monday last at 8:30 p. m. Owing to the size of the gathering, the President's address, which is given on another page, was delivered in a hall at the corner of Thirty-seventh street and Fifth avenue. After the address a collation was served. The attendance of ladies was one of the largest on record. The event of this session was the address by President Hunt on "The Evolution of the American Rolling Mill." This was received with much applause and universal praise.

The papers themselves are not, on the whole, very valuable. Mr. Nagle's paper on the constants for the correction of thermometers under the rapid rise and fall of temperature has a practical bearing, and the results he obtains are interesting, and may lead to the determination of constants of considerable value. His paper on limitations of steam engine economy will be found useful to those who are claiming impossible results from increased steam pressures and increased expansion. He shows that the fundamental principles of the operation of the steam engine limit an increase in efficiency to a lower degree than that claimed by many enthusiastic advocates for high pressures and multiple expansion engines. A study of this paper shows the possibility of savings with a perfect engine. His paper on the tests of Indiana block coal adds to knowledge of the heat value of American coals.

The Brooklyn Pumping Engine of 1860, by Mr. Samuel

McElroy, is an addition to the history of pumping engines.

The Value of a Water Power, by Charles T. Main, discusses the errors that have been made in determining the commercial value of a natural water power. Mr. Main shows that the variation in the rate of flow of a water power has more to do with its commercial value than either the maximum or average horse power that can be developed from it. This paper may be of particular interest to electricians as there is considerable attention now being devoted to taking electric power from waterfalls.

The Idiosyncrasies of Chimney Draught, by W. E. Crane, is a paper describing peculiarities in the action of various chimneys. The paper ends with two statements of interest: "If it shall be proved that forced draught for boilers is the more economical, there would seem to be no good reason for building chimneys over 100 feet high." This paper would be much more complete if it contained some argument relative to the causes of the chimney actions observed in the twelve different instances cited.

Influence of the Steam Jackets of the Pawtucket Pumping Engine, by William Kent, is a continuation of other papers on the same subject. The following from the conclusions is of interest: "The tests above reported, taken in connection with those previously reported, I think prove that in the use of the Pawtucket pumping engine the use of the jackets gives a saving between one per cent. and four per cent., but they do not lead to any more general conclusion than that jackets may be expected to give this saving in a cross compound Corliss engine of 140 H. P., running at about 50 revolutions per minute, supplied with dry steam of 125 pounds gauge pressure and cutting off at about one-fourth stroke in the high and one-third in the low pressure cylinder." This conclusion is a very limited one and seems to justify the conclusions reached by other experimenters, viz., that the steam jacket is not a device which will give a saving under all conditions of steam engine operation. There are those who doubt its efficiency under any condition. All will agree with the author of the paper that "In view of the rapidly increasing use of compound engines with higher pressures and higher speeds than the Pawtucket engine, it is much to be desired that a series of tests should be undertaken in order to learn whether in such engines the steam jacket causes any saving sufficient to compensate for its extra cost." Our readers will remember that the Old Colony compound locomotive, designed by Mr. F. W. Dean, is now running with a steam jacket, and several engineers are very enthusiastic regarding the possible saving from this construction. Hence, here is another reason why it is desirable to obtain information relative to the value of steam jackets under conditions allied to locomotive operation, viz.: "With higher pressures and higher speeds."

The Pawtucket pumping engine has been since it was built one of the most noted engines in the world in point of efficiency. It is one of the engines which gave the late Mr. George H. Corliss the enviable reputation that he had as a designer and builder of pumping engines. In this regard, the last clause of Mr. Kent's paper is pertinent: "It is worthy of notice also that this engine, built nearly fifteen years ago, has not yet been surpassed in economy by any two-cylinder compound engine, nor as a pumping engine has it been surpassed by any type of engine whatever."

Test of a Pulsometer, by D. Volson Wood, describes a test of a pulsometer with a 4-inch delivery and suction pipe. There are no conclusions as to the conditions under which a pulsometer will work at its best. The efficiency, which in this paper is taken as the ratio of the work done to the work equivalent in the heat absorbed, was found to be .012, .016, .013 and .014. The height of the suction was 12.25 ft. and 19.67 ft.

A Combination Iron and Oak Pavement, by J. Wendell Cole, describes a composite pavement made with cast iron pockets and oak blocks sitting in the pockets. There is a drainage hole in the bottom. It is not stated whether the interstices between the blocks and the iron are filled with asphaltum or tar, or anything else. The principal attraction in this paper is a loaded coal wagon with what appears to be a darkey on the seat.

Electric Power Distribution, by H. C. Paulding, is a really valuable paper. Its usefulness may be temporary; that is, during the introduction of electric power for cranes and machinery; but it is just the sort of data that is of practical advantage. The cuts are direct reproductions from photographs, and show the different means of applying electrical power to machinery and cranes. A short description is given of each application. Mr. Paulding's conclusion gives the state of the art: "In conclusion, it is interesting to note the tendency to incorporate electric motors with various classes of machinery, thus forming complete mechanical units. It is to-day possible, for example, to equip a printing or publishing house equal in completeness to any now existing, without using a hanger, line shaft, or belt, each press being complete in itself as far as mechanical connection with the source of power is concerned, the entire transmission being accomplished by means of concealed wires. The same is true of almost every line of industry, while the general application to naval practice is apparently a matter of the immediate future."

Tuesday morning a business meeting was held at the rooms of the society. Professor Hutton brought out several points of interest, and called attention to the desirability of extending an invitation to European engineers to visit this country as guests of the American societies during 1893, the year of the World's Fair. This proposition was favorably received by those present. The \$500 received from the Providence local committee of entertainment has been applied to the library fund. A portrait has been received of the late Henry R. Worthington from his son, Mr. C. C. Worthington, and has been hung on the wall back of the platform beside that of Mr. A. L. Holly.

The report of the Finance Committee shows that the total receipts for the year have been \$19,842.62, but owing to increased expenditures only \$2 remain in the treasury. The report of the Committee on Library and House stated that the building is owned by the Mechanical Engineers' Library Association, of whom it is rented by the American Society of Mechanical Engineers. The income of the Association is derived from this rental and from the rent paid by the Electrical Engineers for the third floor, also from the rental of five bedrooms and the annual dues of \$3 paid by those who have become Fellows of the Library Association. This being a free library is exempt from city taxation.

The report by the Committee on Standards, James W. See, chairman, stated that a bill covering the subject had been introduced into Congress, but had expired, and nothing had therefore been done toward legalizing any standards.

The Committee on Standard Methods of Testing Material, composed of Messrs. Towne, Thurston, Eggleston, Morgan and Henning, reported. Mr. Henning called attention to the international conference of engineers to be held shortly in Vienna to consider the question of determining standards of specimens for testing. An invitation has been sent to the American Societies to participate.

The Committee on Standard Flanges for Pipes reported progress. It was stated by a member that the Master Steam Fitters' Association was working toward the same end, having appointed a committee for that purpose.

In accordance with a notice given at the Providence meeting that certain amendments to the constitution would be brought before the next meeting, there was proposed an increased of dues. After some discussion it was finally voted to raise the initiation fees for new members and associates hereafter elected from \$15 to \$25, and for new juniors from \$10 to \$15 and to raise the dues of present members and associates from \$10 to \$15 and juniors \$5 to \$10. The present membership is between 1,400 and 1,500, and this increase will add materially to the income of the society.

The following officers were elected: President, Charles H. Loring, Brooklyn, N. Y.; Vice-Presidents, G. I. Alden, Worcester, Mass., E. F. C. Davis, Richmond, Va., Irving M. Scott, San Francisco, Cal.; Treasurer, William H. Wiley, New York; Managers, James M. Dodge, Philadelphia, Robert Forsyth, Chicago, Jesse M. Smith, Detroit, Mich.

The result of the vote on the desirability of holding the spring meeting in San Francisco was 723 in favor and 73 against. At the present time 177 members have signified their expectation to attend and 273 are as yet uncertain.

Numerous invitations were received to visit manufacturing and other places of interest in the vicinity of New York.

At the evening session the following papers by A. F. Nagle were read:

"Experiments to determine the rise or fall of a mercurial thermometer under different conditions;" "Test of Indiana block coal at the Chicago West Side Pumping Station;" "Limitations of steam engine economy;" also a paper on "The value of a water power," by Chas. T. Main.

Mr. Emery spoke at some length on the question of awards for damages due to the misappropriation of water power, saying that no general rule could be laid down regarding this matter, but that each case being subject to its own peculiar conditions must be decided on its individual merits, citing as instances a number of well known cases which have been more or less before the courts for some time past.

Mr. Samuel McElroy's paper on "The Brooklyn Pumping Engine of 1860" was read by abstract.

Wednesday the visitors went on an excursion given by the resident members, starting from the foot of Twenty-third street on the North River, on the steamer "Laura M. Starin." They first touched at the Brooklyn Navy Yards, where the steamer "Chicago" was carefully examined both above and below decks. The manner of charging the breech-loading guns proved very interesting, as well as the Hotchkiss rapid firing guns. The compactness of all the machinery in the hold was particularly remarked, the necessity for economy in this respect being, of course, of prime importance, and in all cases the engines for electric lighting, pumping and driving have been set so close together as to leave barely space for oiling and tightening up. The shops were passed through hurriedly for lack of time.

At the De la Vergne Refrigerating Works at 138th street, the party were conducted through all the departments. The buildings of this company have been built

very heavy in order to carry weights on the upper stories, plate girders being used throughout. There is now under way a large erecting shop, which will add materially to the capacity of the plant and relieve the present pressure for space, as with the quantity of work now on hand the crowding in the machine and other departments is great. This company is just about commencing the erection of a 500-ton ice machine for the Busch company of St. Louis, which will be the largest machine yet built. The draughting department here is very complete. The number of tables and their design, together with the well equipped blue printing room give facilities for turning out rapid work of a high quality. The arc light is also used for printing on dark days or when it is necessary to work at night. This company makes a special point of the quality of its fittings and also tests, the piping and other parts of its output in a most careful manner. The piping used is 2-in., extra heavy, cut in standard lengths, and is required to stand a bursting strain of 1,000 lbs. per sq. in. In the tank department, presses are used for shaping the metal, and all soldering is obliged to be of the best in order to slip out the blocks of ice. Specimen blocks were exhibited.

During the run over from the Navy Yard an elaborate lunch was served.

In the evening the guests went to the play at Palmer's, occupying the entire body of the house.

The entertainment committee consisted of: James F. Lewis, E. P. Stratton, John Thomson, J. E. Denton, G. C. Henning, E. V. Clemens, Stevenson Towle and E. A. Stevens. About 350 members and guests went on the day's outing.

Chase's Roller Side Bearing.

The cuts, figs. 1 and 2, show a new roller side bearing which has been considerably used by the Chicago, Boston & Liverpool Co. on its express meat cars. It is made of hardened steel, except the base, which is of cast iron. The centre is formed by a steel pin, around which small rollers fill the space between the central pin and the

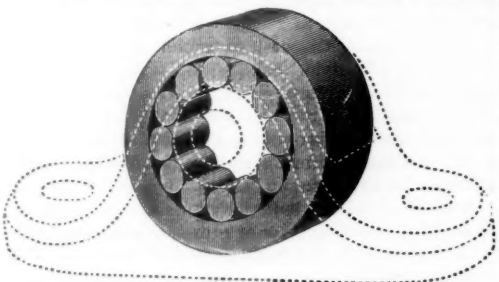


Fig. 1.

ring. The device has only a rolling friction, and offers, therefore, much less resistance to the turning of the trucks of cars, when running from a curved to a straight track and vice versa, than those which slide. The object of this roller side bearing is to reduce the



Fig. 2—Chase's Roller Side Bearing.

fringe wear of wheels, and there can be no doubt of its usefulness for this purpose. One of the defects of previous designs of roller side bearings is removed in this, viz.: that of wearing flat, and thus becoming identical in action with the flat sliding bearing. This bearing is controlled by Mr. R. G. Chase, of the Chicago, Boston & Liverpool Co., at Elsdon, Ill.

THE SCRAP HEAP.

The Northwest Waterways Convention.

The long talked of deep waterways convention which it was thought would be held in Chicago will be held in Washington not later than Dec. 15. The formal call will be issued in a few days. The boards of trade of nearly all the lakeside cities, as well as that of Minneapolis, are endorsing the call for the convention, which is to urge on Congressmen the necessity for the construction of channels where needed to secure not less than 20 or 21 ft. of water, the building of lighthouses, improvement of important harbors and the construction of a channel connecting the lakes with tidewater of a sufficient depth to float our largest vessels. This, it will be noticed, is an important programme. The 21-ft. channel in the chain of lake navigation will probably cost at least four millions, and the improvement of important harbors might easily cost twice as much more; while the channel connecting the lakes with tide water of sufficient depth to float the largest vessels was estimated by Mr. Sweet while State Engineer to probably cost about \$100,000,000, and the aggregate might be \$150,000,000, requiring at four per cent. \$6,000,000 per annum. The service, however, would be rendered to the largest shipping traffic of the world.

The New Philadelphia Terminal of the Reading.

The plans for the new Philadelphia & Reading terminal building in Philadelphia, at Twelfth and Market streets, were published this week, and propose a building which will be one of the finest passenger stations in the country, if not absolutely so. The building will be eight stories high, fronting on Market street, and recalls, in its general style, the Mills building in New York City, resembling in general a large opera-house or public library rather than a railroad station. The architects have produced a handsome and striking design, and one in which they claim utility has not been sacrificed for beauty. It is entirely different from any station building in this country, resembling in general treatment the great European stations. The style is in the late Italian Renaissance.

The building is eight stories high, the first four stories being of pink granite and the other of light brick and terra cotta, the combination producing a striking effect, somewhat resembling the Metropolitan Opera House in New York, but the new structure will be the larger building.

The main floor, with the exception of the six entrances to the station, which are on a level with the sidewalk, is a few steps above the street. Above the entrances are six large arched windows, the entrances and windows projecting a slight distance beyond the upper four stories of the central front, which is surmounted by a clock and group of statuary. At each side of the central front are three double windows on each of the eight floors, the Twelfth street side of the building conforming in general details to the fronts of the wings. Besides the group of statuary over the front, there are three other groups, one surmounting each of the wings. The half basement is to have six stores on Market and one on Twelfth street.

On the first floor are to be ticket offices, a large passenger lobby and the baggage rooms. The second floor contains the general waiting room, 100 x 75 ft., with the ladies' room, 44 x 56 ft., and the dining room and restaurant. Between the second and third floors is a half story, which is to contain the offices of the operating department of the Terminal Co. The remaining floors will be used for the general offices of the company, now located at 227 South Fourth street. The eighth floor will be used for storage and for mechanical apparatus for heating, lighting, etc.

In the rear of the main building the trainshed extends along Twelfth street to Arch street, and is wide enough for thirteen tracks. Between the train gates and the waiting rooms is a lobby 50 ft. wide, extending the whole width of the building. The main building has 200 ft. frontage on Market street, and is 100 ft. deep, and is 132 ft. high from the pavement to top of cornice. The sheds extend to Arch street, and under them from Filbert street north will be the new market house, now on the ground to be occupied by the main building. Work on this part of the structure has been rapidly progressing night and day for some time. It is expected that trains will be running into the station next September, although the structure will not be entirely completed until some months later.

Vengeance at Last.

It is reported that a band of 25 masked men known as "Regulators" boarded a train at Lake, Miss., and took "Bob" Wallace, a colored sleeping car porter, from the train. They led him to the woods with a rope around his neck. Nothing has since been heard of Wallace, and it is believed that he was lynched.

Lake Shipbuilding.

There has been very little work in the lake shipyards since June, but the high freight rates this fall, with the certainty of a large traffic in grain and ore at the commencement of next season, have resulted in forcing orders in nearly all the lake yards, and the orders are almost invariably for what are intended for better vessels than those built during the last season. The captains' quarters will not always have the luxury which has marked previous vessels, but the vessels will be more serviceable and many of them larger. A new one for the Minnesota Steamship Co., which will be constructed at the South Chicago yard, will be 330 ft. on the keel, 45 ft. wide and 24½ ft. deep, carrying 4,000 tons on the ordinary draft of water in lake channels. This, it is claimed, will be the largest boat afloat on any body of fresh water. It, with another boat for the same company, to be constructed at Cleveland, will be ready at the opening of navigation.

Macadam Roads in the South.

The *Manufacturers' Record* states that Jefferson county, Alabama, now has 110 miles of good Macadam roads and is building, or has under contract, 40 miles more; so that it will soon have 150 miles of first-class roads, and adds that good roads are as essential to agricultural prosperity in the South as new railroads. It might have gone further and said that good roads increase the traffic of the railroads to which they form feeders.

The Birmingham *Age* mentions another result of good roads, saying: "The best of it is, wherever these roads lead out from Birmingham, the cotton patch is disappearing and diversified farming is taking its place."

That is a more profitable system of agriculture comes in with better roads, and concurrently the people of Birmingham set down to better supplied tables.

Railroad Taxes.

The New Jersey State Assessors have filed their annual report, giving the returns of assessments of railroad and corporation taxes for the year. The total railroad tax is \$1,429,205, of which the State Treasury will get \$1,050,224, and the taxing districts of the State \$378,980. The total increase in assessment is \$8,000,000, representing an increased tax of \$80,000. The valuation of the Pennsylvania Railroad was raised about \$2,500,000, mainly for the new station at Jersey City.

The Tennessee State Railroad Tax Assessors have completed the assessment of distributable property of the railroads, telegraph lines and quasi corporations. There are 2,824 miles of railroad in the state, valued at \$38,416,837. The valuation ranges from \$2,000 per mile, assessed to the Knoxville & New River, to \$28,000 per mile, assessed to the Louisville & Nashville. The average is \$13,639. The increase of mileage the past year is 217 miles; the increase average in valuation, \$217, and the increase in total valuation, \$3,527,130.

Canadian Iron Imports.

The value of all manufactures of iron imported into Canada in 1890 amounted to \$14,449,378. Of this \$10,566,748 was dutiable, the amount of duty collected thereon being \$2,912,886, or 27.5 per cent., \$3,882,630 coming in duty free. The duties collected amounted to 20.1 per cent. upon the total importation.

Bonds Listed on the New York Stock Exchange.

The Governing Committee of the New York Stock Exchange has added to the lists for dealings new securities, as follows:

Chicago & Erie.—\$500,000 additional first mortgage four and five per cent. gold bonds, making the total amount listed \$11,137,000.

Colorado Midland.—\$495,000 consolidated mortgage four per cent. fifty year gold bonds, making the total amount listed \$4,502,000.

Nashville, Chattanooga & St. Louis.—\$500,000 additional first consolidated mortgage five per cent. gold bonds, making the total amount listed \$3,000,000.

Newport News Shipbuilding & Dry Dock Co. (formerly Chesapeake Dry Dock & Construction Co.)—\$2,000,000 first mortgage five per cent. currency bonds of 1900.

A Guarantee of Honesty.

The Chicago, Milwaukee & St. Paul has received from the United States Guarantee Co. \$5,000 as the amount of the bond of that company on the honesty of George J. Osborn, the defaulting agent of the Union Elevator, Minneapolis.

A Wealthy Car-Knocker.

The following press dispatch is vouched for as substantially correct by a correspondent at Gordon, Pa.:

"Mr. Robert Lawrence, an old man employed as a car inspector for the Philadelphia & Reading at Gordon, was last Friday caught between cars and fatally crushed. Since his death it has been learned that he was worth about \$300,000, which is invested in real estate in Brooklyn. He was born at Port Jervis, N. Y., about 80 years ago, and spent 20 years of his life on the Delaware & Hudson Railroad. In 1855 he left for Brooklyn, being worth \$40,000. There he lived with his sister and invested all his money in real estate. Not content with this, he obtained the position of car inspector on the Reading Road and was sent to Gordon. No one knew of his wealth, and he was always looked upon as poor. His only relative living, his sister in Brooklyn, inherits his fortune."

French Engineers in America.

Three engineers of the Paris, Lyons & Mediterranean Railroad of France, namely, E. Chabal, Engineer of the company; A. Cottin, Inspector of Material; and George Ducouso, Chief of Machine Shops, visited Chicago last week after a profitable trip over the Pennsylvania. Among the other points of interest visited in Chicago were the C. B. & Q. shops at Aurora. Mr. William Forsyth, Mechanical Engineer, took charge of the party in Chicago and conducted the gentlemen through the works. A private car was placed at their service to Aurora and return. These engineers are interested in all features of the equipment of our roads, but nothing attracts their attention so much as the thin sheets of steel used in the fire boxes. Only a few locomotive boilers have been built in France with steel fire boxes, and these failed because of cracks.

Boundary Line between Ohio and Indiana.

There is a possibility that the cities of Fort Wayne, Richmond and Union City will move from Indiana to Ohio. The United States Government has had a party of surveyors out relocating the line between the two states. The work is about done and a report will be ready shortly. The surveyors are reported to have found that the line as specified when Ohio was made a state commences 12 miles west of the present recognized line at the north and runs some 200 miles exactly south till it strikes the present line, making a strip of an average width of 6 miles and 200 miles long, thus giving to Ohio some 1,200 square miles of territory and 200,000 inhabitants. With the Ohio claim admitted as correct, Indiana has a resulting and similar claim against Illinois. Hence the importance of the matter, and the necessity for an early and satisfactory settlement.

The International Railroad Congress.

As we have several times announced, the fourth session of the International Railroad Congress is to be held at St. Petersburg. The meeting will take place from the 10th to 20th of June, 1892. Two hundred and eighty railroad companies and 30 governments have expressed their intention of sending delegates. These companies represent a length of 190,000 kilometers. Reports on stated questions will be made by some of the most eminent railroad men of Europe.

Canada and Fast Atlantic Steamships.

The Dominion Government has decided to offer an annual subsidy of \$750,000 to secure a fast line steamship service between Halifax and a port in Great Britain equal to any of the fast lines now sailing between New York and Great Britain. There has been a standing offer of an annual subsidy of \$500,000, which has not proved a sufficient inducement to any company to undertake the service. It is understood that the British Government will supplement the subsidy of the Canadian Government.

Atlantic & Pacific Tunnel.

Mark Pomeroy, of unsavory reputation as "Brick," is at the front again with his scheme for the "Atlantic & Pacific tunnel." He announces that he is going to Denver to stay until the tunnel is completed. He says that the tunnel is bored four-fifths of a mile at the east end and one-fifth of a mile at the west, and that the citizens of Denver have come to realize that it is necessary and, further, that it will be completed in 1895. The Denver, Apex & Western Railroad Co. has contracted to operate it. The railroad will pay the tunnel company \$1 for each passenger and 50 cents for each ton of freight carried through it, the tunnel company to provide electric motors. "When this is completed the distance between Salt Lake City and Denver will be decreased by 250 miles."

A New Mail Route to India.

The British Government is proposing to send the Indian mails by the Dover-Ostend line of boats through Belgium, Germany, Austria-Hungary, Servia and Turkey to Salonica, instead of via Calais, through France and Italy to Brindisi. It is expected that 36 hours can be saved by the new route if they can protect the trains from brigandage in Turkey and after some improvements have been made at Salonica. The time by the present route from London to Bombay is 16½ days, so the proposed saving is one of nearly 10 per cent. This proposed route does not seem satisfactory to the Italian Government, and they are urging the railroad authorities to shorten their time, increase the comfort of their cars and run trains on to the dock alongside of the steamers instead of stopping them as at present about a mile from the ship. Belgium and the countries on the new route, on the other hand, are more or less elated, as the Peninsular traffic is of considerable value, not only to the railroads but to the country it passes through.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The question whether to run freight train crews, as much as possible, in the same kind of work, on the same schedules, with the same associates, or to "run them around," as is commonly done, is further discussed in this issue by Mr. Watson. Concerning the most interesting point disputed by our correspondents, that concerning the facility or success with which underhanded practices are detected, we are still left, however, in the dark. This is naturally a subject on which superintendents are not very free to describe their methods in public, but any superintendent who has even a few sly and tricky men among his force must feel the need of considerable close inspection beyond and outside of that provided for in the usual organization, and we do not imagine that the West Shore officers succeed any better than those equally wise and careful on other roads in getting men who will confess their mistakes when not compelled to. Notwithstanding the admitted advantages of running crews first-in-first-out, the main reason for deciding to run them in that way has in many cases been the desire to equalize the pay of the men, and the plan has no doubt been adopted by some roads merely because it is an easy plan; but it is at best a necessary evil, for the constant and extreme irregularity of hours, which is an almost inevitable accompaniment, must tend to impair men's efficiency, both physically and morally. Conductors and engineers will agree to the "chain gang" in spite of its unpleasant features, however, unless they feel sure that their relative standing and pay will be constantly adjusted according to their views of justice; and as it is impossible for even the best superintendent to make this adjustment so as to suit all his men, the chain-gang fashion will doubtless continue indefinitely. Every superintendent, however, who can keep his men contented under a graded system, like the West Shore's, can have the satisfaction of knowing that his action tends to promote the men's health and contentment, whatever may be the case as to their tricks.

Another correspondent, a locomotive engineer in Greenville, S. C., writes criticising the views of Archimedes Stephenson Watt, and pokes fun at his name and the literary centre that he hails from. This engineman objects to the view that fresh men are more alert and thus more valuable than the old ones, and thinks that our correspondent must lack experience. We can assure him that his surmise is wrong and that he is criticising one of the most successful and experienced railroad officers in the United States. Moreover, it is the testimony of experience, in more than one department of railroading, that the mourning which ensues on the resignation of a trusted and experienced man has often changed to gratulation when it turned out that the successor was even better than the man whose place he filled. It must not, of course, be assumed that the new man was in such cases selected without careful inquiry concerning his merits. The explanation

of this state of things is partly found in the fact that the new man has the benefit of his predecessor's experience, to which he adds his own enthusiasm, and that the superior also has more experience to aid him in making a selection than he had when he engaged the former man. Our engineman next defends his Brotherhood against the allegation that signals are deliberately disregarded and that guilty members are unduly shielded. It is, indeed, hard to prove that a runner "deliberately" disregards a signal, but, on the other hand, it is impossible to find any more satisfactory explanation when an act of that kind is committed in broad daylight, with no distracting circumstances, by a man who claims that his brain and his physical organization generally are in a perfectly normal condition. Our correspondent says that when enginemen are thought to be defending an unworthy brother it will be found that the man under trial is being made the scapegoat for some officer.

The estimates of freight cars equipped with vertical plane couplers and with air brakes, which were presented to the Committee on National Legislation last week, were acknowledged to be quite incomplete. Those figures were printed on page 798 of our last issue. In fact they were so incomplete that we do not see what value they can have. The mileage from which reports were received was 125,123, out of 167,000 miles reported by Poor as built up to Dec. 30, 1891, to which several thousand miles have since been added. The committee reported a total on this mileage of 978,161 freight cars; Poor estimates 1,062,000 Dec. 31, 1890; Colonel Haines estimates 1,200,000 now. Very likely this last estimate is too large, but that of the committee is much too small for the country, but perhaps not for the mileage reported on. The committee reports 40,231 of these cars equipped with the Janney coupler and 13,279 designated simply as M. C. B., in which latter were doubtless some Janney couplers. Colonel Haines estimated 100,000 cars as equipped with Janney couplers. This last, so far as we can judge, is a very accurate estimate. Certainly the variation from it is but a small percentage. It is obvious that the committee's figures of Janney couplers are of no value. The Gould coupler is reported by the committee as on 23,357 cars. We are informed by the Gould company that 104,600 couplers have been put out, that is for 52,300 cars; how many of these are still in service we are not told, but a rival house has estimated them as not less than 40,000 cars. The Standard Company claims to have at least 24,000 cars now equipped; the Thurmond 8,300, and the Trojan 5,000. It would not be necessary to use nearly all of the Hinson cars, reported by the committee, to bring the total other than the Janney up to 100,000. This was Colonel Haines' estimate. We have before us other and independent and very plausible figures that indicate that this estimate is within the truth. Therefore we may conclude that there are now running at least 200,000 cars equipped with M. C. B. couplers. Further, the McConway & Torley Company shipped couplers for 4,570 cars in October, and for 4,380 in September. This suggests that something like 8,000 cars a month are now being equipped with all types of M. C. B. couplers. This rate probably will not satisfy the coupler makers or the advocates of national legislation, but it is certainly very encouraging.

It is some time since there has been a discussion on the proper position of brakes on freight cars. It has been generally supposed that the balance of opinion was in favor of putting the brakes on the truck on the inside between the wheels, but this does not seem to be the case. Two of the largest roads in the west have decided, after trying both methods of hanging, namely, on the truck and the car body, to put the brakes for all freight cars outside of the wheels and hang them to the body of the car. One prominent superintendent of motive power, much respected for his sound and conservative opinion, writes as follows regarding this matter: "We hang all our brakes on the outside of the wheels and to the body of the cars. We do this because it simplifies the construction of the truck, which is the principal part of the car requiring repairs. It attaches the brakes where they are the least affected by shocks caused in passing over the track, and in this position they are more accessible for repairs than in any other. One can readily tell by standing with his back to a passing train which of the cars have the brakes hung from the body and which from the trucks. I have yet been unable to notice any difficulty arising from this practice, and can see no good ground for the various objections which have been offered to this practice." At a recent meeting of the Western Railway Club, an air-brake inspector of the Burlington

called attention to some experiments he had made regarding piston travel for light and loaded cars, with the brakes hung inside and outside. With the brakes hung outside of the wheels, and therefore above the springs, the piston travel was longer with a loaded car owing to the compression of the springs. With the brakes hung inside of the wheels and connected rigidly to the transoms, and therefore below the springs, there was no difference in the piston travel, whether the car was loaded or unloaded. The increase in the piston travel when the brakes were hung on the body of the car was not great enough to make any material difference; and as it was not said where the brakes were hung relative to the centre of the wheels, we cannot judge as to the value of the experiments made. There should not be any material difference in the piston travel, whether the car is loaded or unloaded, if the brake shoes are hung as high up on the wheel as they should be. When the car is unloaded the centre of the brake shoe should be on a horizontal line with the centre of the wheel. This is generally impossible when the brakes are hung on the trucks, owing to the interference of the brake beam with the under side of the transoms; but when the brakes are hung outside they may be placed at any desired height. One thing is quite certain, the cost of maintenance of the brake beam and its attachments is considerably less when the beams are supported from some point above the springs.

Census Railroad Statistics for Ohio, Michigan and Indiana.

The Census Bureau has now issued its bulletin of railroad statistics for "Group III," which includes the states we have been accustomed to designate as "North Interior," namely, Ohio, Indiana and the southern peninsula of Michigan, together with the small parts of lines in Pennsylvania and New York, which are west of the western termini of the Eastern trunk lines—Buffalo, Salamanca, Pittsburgh, etc. This completes the statistics of the great industrial territory of the United States, though a division made especially on this basis ought to include Illinois, which must, as a manufacturing state, now greatly surpass Michigan and Indiana, and closely approach Ohio.

It is also, as the bulletin points out, a territory crossed by a great number of railroads whose through rates are "trunk-line rates," that is, based on the through rates between New York and Chicago. And it may be added that the junction points which take these through rates are so numerous and near together in this territory that they very greatly limit the local rates which it is possible to charge. The consequence of this is that in this territory, which has an immense traffic, the railroads as a whole are exceptionally unprofitable. The territory lies between the trunk lines and the West proper—the territory which supplies the great tonnage of grain and provisions; and as every trunk line has felt compelled to control connection to the traffic centres of the West, such as Cincinnati, St. Louis and Chicago, there has been an undue multiplication of lines across this intervening territory. The example of very profitable lines like the Fort Wayne and the Lake Shore stimulated the construction of numerous other lines which aimed to secure a share of their through traffic, with disastrous results. This is a territory in which there is a considerable coal and ore traffic, though the greatest part of the coal carried originates in comparatively small districts of Eastern Ohio and Western Pennsylvania, and the ore is carried but short distances. This territory is over-supplied with railroads, but capitalists have apparently only recently got a realizing sense of that fact; for while it counted 14,417 miles of railroad in 1880, three years later it has 19,539 miles, an increase of 35 per cent. But the results of building such lines as the New York, Chicago & St. Louis seem to have been taken to heart, and in the last seven years of the decade only 2,055 miles of railroad were added, against 5,122 miles in the first three years.

While the mileage increased nearly 50 per cent. in the ten years from 1880 to 1889, the number of locomotives increased only 44 per cent., though owing to the greater capacity of the newer locomotives, the aggregate locomotive capacity doubtless increased much more than the mileage; and the same may be said of the stock of freight cars, which are shown to have increased 97 per cent. in number. The stock of passenger cars, (their average capacity is substantially unchanged) increased rapidly (28 per cent.) until 1883, scarcely at all then till after 1886; and moderately then (11 per cent.) till 1889.

The freight traffic (ton-miles) increased 87 per cent. and the passenger traffic 73 per cent., but the freight train mileage only 65½ per cent., while the passenger train mileage increased 99 per cent., the average freight

train load having increased from 161½ to 215 tons, but the average passenger train load having decreased from 44 to 38—the latter an extremely low average, being only two-thirds of a full car load.

The earnings per passenger train mile were also exceptionally low in 1889, namely, 99 cent., against \$1.19 in 1880. The earnings per freight train mile, in spite of the great increase in average load, decreased from \$1.51 to \$1.29, so that the immense saving in expense by this improvement, and much more, went wholly to the benefit of the public. The 87 per cent. increase in freight traffic yielded only 41 per cent. increase in freight earnings, and the 73 per cent. increase in passenger traffic 65 per cent. in passenger earnings. Counting one passenger mile as equivalent to two ton-miles, the aggregate increase in traffic was 84 per cent., but the increase in gross earnings was only 48 per cent., and the increase in net earnings less than 27 per cent.

The additional work (84 per cent.) was done with an increase of 60 per cent. in the total working expenses and of 46½ per cent. in the number of employes, which is considerably less than the rate of increase in total train mileage (76 per cent.), but nearly as great as the increase in miles of road (50 per cent.). The portion of the working expenses charged to "conducting transportation," however, increased 78 per cent., or very nearly the same as the train mileage.

The average rate received decreased from 2.167 to 2.090 cents (4 per cent.) per passenger mile, and from 0.892 to 0.684 cent (23 per cent.) per ton mile. This average for freight will doubtless be the lowest of any group in the country, and is much lower than in any foreign country. By the previous bulletins the average was 0.808 cent in the Middle States, and 1.47 cents in New England. The average length of haul was 65½ miles in New England, 95 miles in the Middle States and 120 miles in "Group III.," now reported; but this difference is not enough to justify, by itself, the difference in the rates, though it is true that a very large share of the through freight in these "North Interior" States has no terminal expense whatever within those states; while in the Middle States and New England it has usually one terminal. We suppose that "Group III." actually includes the Chicago ends of all the lines extending from Chicago eastward, though the bulletin does not say so. If they were not included, very little of through freight would have any terminal.

As a further indication of the little value as statistical data of a statement of the number of tons carried, we call attention to the fact that the larger part of the "tons" of through freight which count once in this Group III. must have been counted before in "Group II.," and a goodly number a third time in "Group I."

In Group III. the returns made on the capital invested in the railroads, paid in the form of interest, rentals and dividends, amounted to \$1,891 per mile in 1880 and to \$1,719 in 1889, the dividends having decreased from \$497 to \$275 per mile. The aggregate amount paid in dividends has decreased as well as the amount per mile. The aggregate increase in net earnings is at the rate of \$1,876 per mile of the 7,148 miles of railroad added since 1880, and it must be borne in mind that many millions have been expended meanwhile in improving and increasing the equipment of the old lines, so that it is evident that the territory in question has been a decidedly unproductive field for railroad investments since 1880.

The three groups so far reported in many respects make one homogeneous whole, and would be still more so were the state of Illinois included, so as to cover nearly the whole territory in which through rates are based on the Chicago-New York rate, as well as the most densely peopled part of the country and that including its chief manufacturing industries. This territory can be compared more fairly with such countries as England, France and Germany than the country as a whole, or any single state. There is, however, a very good reason for not including Illinois; the statistics for that state probably could not be had, as so many of its principal railroads have only a fraction of their systems within its borders.

The density of traffic in the three groups, reduced to the equivalent movement of trains, passengers and tons of freight each way daily over the entire mileage in each group, compare as follows:

Movement each way daily.	Group I.	Group II.	Group III.
Tons freight.....	499	1,699	834
Freight trains.....	4.33	7.62	5.28
No. passengers.....	332	242	119
Passenger trains.....	5.50	5.15	3.09

In the states between Illinois and Pennsylvania, we see the freight traffic is not half as heavy as in the Middle States, while the freight rate is 15 per cent. lower; the freight traffic is two-thirds heavier than in New England, while the rate is not half as great. The passenger traffic is not half as great as in the Middle

States in this Group III. next west, but the passenger rate is very little higher; it is little more than one-third as heavy as in New England, and the rate is not 10 per cent. higher. In New England, the average movement of passengers is but one-third less than that of tons of freight; but in the Middle States there are 7 ton-miles for every passenger mile, and in the group next west there is just the same proportion of freight to passengers.

The percentage of growth of traffic since 1880 in the three groups, as also of mileage of road, has been:

	Group I.	Group II.	Group III.
Passenger.....	77.9	99.0	73.1
Freight.....	65.9	84.0	87.4
Mileage.....	16.3	26.7	50.0

It seems thus that in the most westerly groups the aggregate passenger traffic increased less rapidly than in either of the others, but the freight traffic a little more rapidly than in the middle group, and much faster than in the Eastern. The increase in mileage seems to have had very little to do with the growth of traffic, and in all three of the groups so far reported doubtless actually had very little to do with it. Probably if, instead of the 11,960 miles added in these three groups since 1880, only 3,000 miles had been built, the traffic would have been just as great, for this is just the territory where lines were built chiefly to get a share of a traffic already developed, and only to a small extent to reach sources of traffic which had as yet no outlet. In the territory next west, while a vast mileage of unnecessary railroads has been constructed of late years, at the same time an immense territory has been for the first time made available by means of new lines.

Objections to National Legislation on Car-Couplers.

In referring last week to the subject of National legislation to compel or regulate the use of safety appliances on railroads, we said that the railroad officers speaking at the Commissioners' hearing presented no arguments against legislation which were not already familiar to readers of the *Railroad Gazette*; whereupon a correspondent reminds us that it is nearly two years since we last discussed this topic, and asks that the arguments referred to be re-stated. We cannot enter upon such an extended investigation of the fundamentals of political economy as would be required to fully comply with this request, and our report of what was said by Mr. Forney and Major Myers summarizes the salient points very well. The principal point that they did not touch upon is the possible evil to be feared from political influences and the limitations and weaknesses of executive officers.

The true principle governing this matter is that the state should interfere with private enterprise only when absolutely necessary for the protection of the people; but once a just law is enacted regulating one appliance, demagogues will make it a deceptive pretext for the unjust "regulation" of some other appliance; whereas each question should be considered wholly on its own merits. But the merits of the coupler and brake questions cannot be considered except by a well-qualified Commission, for a main feature of any just law must be that concerning the time to be allowed each individual road for equipping its cars, so that the question at once arises, Who is to administer this law? The British Board of Trade, in ordering the adoption of signals and brakes, varied the dates greatly for different roads, but the poorer roads nevertheless complained loudly of hardship and often, no doubt, with justice. We cannot expect to find men any better qualified than the officers of the Royal Engineers to deal out exact justice in such a case; and, in fact, no one has yet formulated any precise plan for a technical commission. The Interstate Commerce Commission has power to "inquire into the management of the business" of the roads, which phrase doubtless covers technical as well as purely legal questions, but the Commission is composed wholly of lawyers. There is already much more than enough work for five lawyers in their own special sphere, and, in fact, the Board, just now consisting of only three members, is at present unequal to the tasks already laid upon it. Part of this is owing to the inexperience of the members, and it is fair to say that the exigencies of party politics and the prevailing notion that any lawyer is good enough to fill a position of this kind are also responsible for a share. Should we fare any better with a technical commission?

It cannot be said that the individual states have done much to give encouragement in this direction. Even in Massachusetts, the most enterprising state in this respect, an excellent engineer, Clemens Herschel, was dropped from the Commission to make room for a man whose first qualification, in the eye of the appointing power, was that he suited a good number of

voters. It has repeatedly been the experience of the past that laws to compel railroads to use safety appliances have done more harm than good, or would have done more harm than good if they had been enforced. In this very matter of couplers, the efforts made by various states in times past would, if they had succeeded, have prevented the development and use of the M. C. B. coupler. Similarly, in the matter of car heating, legislation and public opinion have forced large expenditures that have already been proved to be wasteful, and more money would have been wasted if the railroads had gone ahead as the lawmakers tried to make them go. In short it is a matter of extreme difficulty to frame and administer a law in such a way that it will not actually retard progress. It is for the business interests of railroads to make operation safe, and the community at large has a much less direct interest in this than the railroads have; and legislators and commissioners have far less knowledge of the means of safety than railroad officers have.

From these considerations it will be seen that to be harmless, let alone usefulness, any coupler or brake law must undertake to accomplish but a very little. The really serious questions connected with these appliances are those concerning the improvements yet needing to be made in them, and these, being very difficult, can be successfully grappled with only by those who have the most vital interest in them; that is, the same men in whose hands they now are.

Then there is the constitutional question. The line between the powers of the individual states and those of the general government in this matter have not yet been drawn with any distinctness. Several suits are now pending, but the United States Supreme Court in every instance takes care to decide just as little of the question as possible. Interstate commerce is subject to Congress, but "police regulation" comes within the power of the individual state, and safety appliances seem to come under the head of police regulation. Mr. Coffin, one of the few most consistent advocates of legislation, is compelled to add in every case "on cars used in interstate commerce," a phrase almost as nugatory, in a legal aspect, under the present state of our laws, as that meaningless jumble, so common in liquor laws, which says that intoxicants "shall not be manufactured as a beverage." Possibly the constitution will have to be amended. The state commissioners will doubtless, in most cases, present to their respective legislatures bills corresponding to whatever Congress may decide upon, but the passage of such laws is not by any means to be relied upon as a certainty. It is to be remembered that the English law of 1889, compelling the adoption of power brakes on passenger trains, cannot be a pattern for us in the matter of couplers, for it does not require uniformity throughout the country, which is the desideratum here. In view of the terrors of the transition period, which we do not blame the brakemen for emphasizing, any law not requiring this uniformity would be far worse than useless, for it would greatly encourage those manufacturers who desire diversity.

The strength of our law, if we have one and it has any strength, must lie in its careful adaptation to the facts as they exist. Mr. Ely said that the Pennsylvania could not possibly move any faster in carrying out the reforms under discussion, whatever the law might say; and we may safely assume that this was a reasonable statement. If a law can be devised that will simply assure that this progress be kept up, that will make other companies follow as well as they are able, and that will not have what the doctors call unpleasant sequelæ, it will probably be harmless. What the railroads are afraid of is that, as in Iowa, one law, like this, will compel them to spend money, while another will prevent their earning it. Reasonable politicians have no desire to thus hamper the railroads on both sides at the same time; but what assurance is there that they can carry out their reasonable views?

Statistics of Train Accidents.

The fact that the statistics of train accidents published in the *Railroad Gazette* month by month embrace a high percentage of all the accidents of the classes enumerated that actually occur is again confirmed by the statistics of passengers and employes killed and injured which have been compiled by the Interstate Commerce Commission and which were published in the *Railroad Gazette* last week; though, as we pointed out when the previous national report was issued (*Railroad Gazette*, June 13, 1890), there is so much difference in matters of detail that the accuracy of the figures cannot be tested item by item. The Government statistician reports 113 passengers killed in collisions, derailments and "other" train accidents. The *Railroad Gazette* records for the same time (year ending June 30, 1890) showed 112 passengers killed; which certainly goes to show that prac-

tically all the serious passenger train accidents are tabulated by us. The number of passengers injured is, indeed, a third less in our tables than in the official returns; but, as we have often pointed out, the number of passengers injured is an exceedingly variable quantity. It is our custom to take the conservative view, and as between two different accounts of an accident, to base our record on that showing the smaller number of persons injured.

But of these 113 passengers the statistician reports 32, nearly one-third of the whole, killed by "other" train accidents, whereas in our records 53 were killed in collisions, 59 in derailments and none in the third class; from which it will be seen that many accidents classed by us as collisions or derailments are reported by rail, road officers as something else. This at once explains in a large measure the differences in the other columns of the records. The number of employes killed, as published by us, was 443, which is 97 less than the statistician reports; but nearly one-third of the 540 in the official report were killed in "other" accidents, and it seems likely that many accidents are included which belong to classes that are omitted from our account entirely. As was shown last year the term "train accident" is apparently used to cover the killing of a tramp or trespasser where the train suffers no damage whatever. This would affect the record of casualties to trainmen, as well as those to tramps (though not those to passengers), for, no doubt, many fatal accidents to brakemen, etc., occur in connection with slight collisions or derailments in which the damage to cars is so small that it is not mentioned at all in the published account, thus leading us to throw aside the report as not coming within the scope of our record.

The Government figures (casualties on railroads from all causes) show marked increases in nearly all the items under the head of employes and the same is true in general of passengers, though the total of passengers killed in the earlier year was 310 as against 285 in the later, the former including the Mud Run disaster of October, 1888, where 66 were killed. "Other persons," both killed and injured, foot up about the same in both years. Whether the increase in casualties to employes is wholly actual or is partly due to more careful reporting cannot be told, but the increase in employes killed in connection with the operation of trains* (from 1,339 to 1,555) is 16 per cent., while the increase in mileage of freight and mixed trains for the year (according to Poor's manual, whose year, though variable, is not very far different) is only 12 per cent. over the previous year. The increase in trainmen killed was 277 (from 1,179 to 1,456) or 23 per cent. The number of employes killed in connection with the running of trains* (1,555 to June 30, '90 and 1,339 to June 30, '89) was considerably greater than the number of "trainmen" reported killed.

The classification of casualties according to classes of causes which is given monthly in the *Railroad Gazette* foots up for the government year as follows:

Year ending June 30, 1890.				
	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road.....	20	221	56	83
Defects of equipment.....	3	71	25	61
Negligence in operating.....	70	443	240	795
Unforeseen obstructions and maliciousness.....	8	97	66	144
Unexplained.....	11	134	62	141
Total.....	112	966	443	1,229
Gov't report same year.....	113	1,395	540	2,649

Owing to a number of accidents which have recently occurred when persons other than the engineer and fireman were riding on the engine, there is some agitation now of the question as to whether outsiders should be permitted to ride in a locomotive cab under any circumstances. Those who have watched an engineer know that he will frequently turn to talk for more or less time, trusting to luck that the track may be clear ahead. Familiarity with danger and dangerous conditions, and frequently passing over the same section of road, however dangerous, with freedom from accidents, will result in what may not be recklessness, but certainly is heedlessness on the part of the engine driver. The popular opinion is that the engineer is always peering out at the front watching for obstructions and dangerous places, while the cold fact is that sometimes he is and sometimes he is not. Generally he is attentive when entering yards where there are many signals, and at points where there has been a wreck or where he has ever seen anything on the track. Points, although they may be dangerous, that he has passed in safety many times are not always watched. Again, under the average conditions of railroading, the safety of the train or the passengers is not wholly in the hands of the engineer. If the track is all right and the switches are properly set, he could hardly wreck the train if he wished to do so. The mere passing of a signal that is set to danger does not necessarily result in danger to the train; all that depends upon the proximity of the danger point to the signal. But although in general the safety of the train does not depend upon the engineer, yet at any instant during the progress of a train at speed a condition may arise that will throw the entire responsibility of the safety of the passengers into his hands, and this is the reason why he should always be on the alert. This alertness is essential to safety, and always will be so. It is impossible

* That is, excluding accidents "at highway crossings," "at stations," "other causes" and "unclassified."

to so perfect all the materials of construction and the conditions of operation that accidental dangers will not exist. If it could be determined just what are the moments when alertness is necessary on the part of the engineer, then we might say that there would be no harm in permitting other than the regular enginemen to ride on the locomotive; but as long as accidental dangers may occur at any instant, thus requiring continual alertness on the part of the men in charge, it is neither safe nor advisable to permit outsiders to ride on an engine when at speed. All who have heard the continuous string of questions propounded to an engineer by a visitor will agree that such persons have no business on a locomotive when the responsibility for the safety of the train may at any moment be thrust upon those in charge. Particularly is this convincing when we remember that the instant of danger is only to be discovered by close and continuous attention to the engine, the train orders and the track ahead.

Reports of train robberies and attempts at robbery have been plenty the past week, the most notable case being near Chicago, whose reporters quickly embraced the opportunity to send out two columns of news. On Wednesday night a train on the Chicago, Milwaukee & St. Paul was robbed by a gang of masked desperadoes, variously stated to number six or a dozen. They boarded the train at Western Union Junction, 62 miles north of Chicago, and compelled the engineer to stop the train about three miles beyond. They then blew open the express car with bombs and forced the express messenger to surrender the keys of the way safe, which they rifled. The through safes they threw out of the car, the trainmen in the meantime being guarded with Winchester rifles. The train was then allowed to proceed. The alarm was given by the rear brakeman, and a posse arrived in time to recover the through safes intact. It is not known definitely how much was stolen, but it was between \$2,000 and \$3,000. The passengers were not disturbed. An officer of the American Express Company who was interviewed says, pertinently: "The train robbers at Western Union Junction have made good their escape. They got the contents of the local safe, and the other two safes were not opened. We are entirely at the mercy of train robbers, they can use dynamite with such advantage. It is utterly impossible to construct a car and arm and drill the train hands so as to offer any opposition. The transportation of valuables is growing more hazardous every day. People think 40 cents for \$1,000 an extortionate charge, when in fact it is our experience that it is worth a great deal more."

On the Missouri, Kansas & Texas at South Canadian, I. T., last Saturday night, an attack from well-known desperadoes was apprehended, and an extra engine was run ahead of the regular passenger train. Near Collinsville, Ala., on the night of November 11, an attempt to stop and rob the south bound limited express of the Alabama Great Southern was frustrated. It appears that a gang of roughs took possession of the passenger station and defied the agent, but were finally driven off with the aid of citizens, who fired on them. At Greensburg, Pa., last week, Ellsworth Luce was sentenced to eight years' imprisonment for two attempts at train wrecking on the Pittsburgh & Lake Erie. At Petersburg, Va., on the 9th, a boy sixteen years old was sentenced to five years' imprisonment for attempting to wreck a passenger train on the Richmond & Petersburg, two months ago. At Sioux City, a discharged railroad employe, has confessed that last January he removed the spikes from a rail on the Sioux City & Pacific, causing the wreck of a passenger train just on the edge of the city, in which an engineer and fireman were injured.

The report of the special committee of the Western Passenger Association, recommending the establishment of a rate bureau to be under the charge of the chairman of that association, which was briefly referred to in these columns Nov. 6, gives some interesting figures concerning the cost of rate sheets. The committee, Messrs. Cairns, Kniskern and Wakeley, made inquiries of a number of experienced traffic men in the Central Association and elsewhere, and find a unanimous sentiment that such a bureau would be profitable and promote the smooth conduct of business in the Association. It is even held that participation of a road in a rate sheet at a border city, where numerous outside lines are partners, is a constant violation of the Association agreement, rates being made without proper consultation with members of the Association. In the Western passenger territory there are now 15 joint rate sheets, issued at as many different cities. These cost about \$14,000 a year, of which the lines in the Western Passenger Association pay about \$8,500. It is believed that the same territory and many additional towns can be provided for at an expense of less than \$9,000 if the work is all done at one point. A little money can be made by selling sheets to outside roads. The cost of the 15 sheets issued by the Central Traffic Association is \$9,000 a year. Although the proposed bureau will be under the direct charge of the chairman, it will probably be so organized that it could be readily continued even if the Passenger Association should go to pieces. The committee recommends that sheets be published only three times a year, that is, on the first days of February, June and October. The change from monthly to quarterly was successfully

made, and quarterly publications are often postponed several months, there being no demand for a new sheet at the date of regular issue. The dates above named come near the time when changes are most likely to be necessary.

A reporter of the Fort Worth *Gazette* who has made a summary of the work of the Texas Railroad Commission during its five months existence, says that the Board has about finished making commodity tariffs and will soon issue a general merchandise tariff for the roads of the state. In this it is not intended to make any marked reduction from the present rates. It seems that the commodity tariffs cover all of the intrastate traffic about which there is much contention. The commission has sent out blanks asking the railroads for the great variety of information which the law requires the board to gather. The reporter, probably echoing the views of the commissioners, says that the cotton tariff made by them has saved the farmers of Texas a million dollars and has "neither bankrupted any road nor put it in the hands of a receiver." The question whether the reduction of rates in Texas has not compelled the roads to unwarrantably draw upon the earnings in other states to support the lines in Texas does not, however, receive the reporter's attention. Probably he does not take a very lively interest in that phase of the problem, nor see any connection between it and the fact that large investors are at present exceedingly careful not to build any railroad in that state. Again, a railroad officer whose opinions are printed in a Texas paper makes the pertinent suggestion:

"It might be well for the commissioners to inquire if they have actually made delivery of this \$1,000,000 to the farmer. The reduction in rate goes to the middle man of the farmer than to the producer or consumer. It certainly has in specific instances in this state. Take the case of cotton seed. The minimum rate on cotton seed is four cents and the maximum 20 cents, the difference \$3.20 per ton. Now if the theory of the commission is correct, the oil mills should pay \$3.20 more per ton for seed where the minimum rate applies than at a point where the maximum rate applies. We find, however, that the mills are paying uniformly \$6.50 or \$7 per ton and pocketing any difference in price that the difference in rate may secure them. . . . I do not think the commission will contend that the price paid for cotton this season is any greater than it was last season."

The investigation before the federal grand jury of alleged violations of the Interstate Commerce law which has been going on at Chicago for over a week seems to be making slow progress. The following officials are known to have been subpoenaed, and have either testified or been excused: A. Fell, Western Freight Manager, and W. H. Smith, Agent, Delaware, Lackawanna & Western; G. B. Spriggs, General Freight Agent, and I. L. Lockwood, Agent, Nickel Plate; T. N. Jarvis, Manager, and I. L. Lafreniere, Agent, Traders' Despatch; D. B. Howard and Sumner Hopkins, Auditor and Assistant Freight Agent, Wabash; W. L. Dougherty, Agent, Lehigh Valley and Wabash. The missing employes of Swift & Co., Messrs. Briggs, Fay, Bowles and Barlett, were present last week, and were excused until the 16th, when they were called in again and Mr. Bowles was again asked to testify, and again refused. James D. Tuohy, local freight agent of the Chicago, St. Paul & Kansas City, was subsequently called, but the books he produced were not the ones the prosecution desired and he was excused and a new subpoena issued against him for the production of other books by which they expect to be able to show rebates paid to Swift & Co. A. S. Winans, local freight agent of the Wabash, has also been subpoenaed. In regard to the complaints on behalf of some railroad men that only they and not the equally guilty shippers are brought under the ban of the law, Special Agent Kretschmer, of the Interstate Commerce Commission, is reported to have said:

"Our evidence so far has been obtained almost exclusively from small shippers. It is self-defense with them, as by reason of cut rates big competitors often force them out of business. The remedy for the complaints of the railroads is in their own hands. The law says the shipper is equally guilty with the railroad man when a cut rate is given. If the railroads will furnish us evidence we will prosecute the shippers as well as the railroads."

In other words, the shippers "give one another away," while the railroads pursue the opposite course.

The returns of the *American Manufacturer* show that the capacity of furnaces in blast on the first of this month was 192,743 gross tons. Hence the approximate make for the month of October was 829,653 tons of 2,240 pounds. This is a large production, probably larger than any other country can show for any one month, and it is 8,430 tons more than our total production for 1890. As a matter of fact, there is no record of a make equal to or exceeding 800,000 in this country for any years previous to 1863, except 1847, 1848 and 1860. As comparing the makes by months for the last three half-years, we have, taking the furnace capacities as returned by the *American Manufacturer*, in gross tons:

	1889.	1890.	1891.
July.....	389,032	739,215	732,237
August.....	615,132	712,295	757,814
September.....	531,298	730,634	763,946
October.....	695,780	791,282	829,653
November.....	708,795	775,515
December.....	752,899	765,799

It should be noted that the approximate production given above for the last part of 1889 should be increased by one per cent. to make it coincide with Mr.

Swank's return of total production, and that given for 1890 should likewise be increased by 1.2 per cent. All of this pig iron is not going promptly into consumption and stocks are undoubtedly increasing, but on the other hand there is no marked weakening in prices. The market is thought to be hardening, and it is said that a speculative half million put into pig iron would boom the market essentially.

The Baldwin Locomotive Works are making a new departure in designing boilers for compound engines. The plates are much thicker. All boilers for compound work are designed to have a factor of safety of five at 200 lbs. pressure, or a factor of six at 175 lbs. pressure. These factors of safety are ample for boiler work, and the pressure can be increased to 200 lbs. per square inch with absolute safety on all recent engines built by these works.

Our readers will remember that the twenty, 10-wheel engines built for the Erie by the Baldwin Locomotive Works had the Vauclain wrought iron driving wheels. The six drivers carry 96,000 lbs. total. The engines have been in operation nearly a year with no failures in the wheels. This is worthy of note, as the weight of the wheels is very much less than the cast iron wheels formerly used.

NEW PUBLICATIONS.

Electricity for Engineers. By Charles Desmond. Bridgeport: Frederick Keppey. Revised edition. Price \$2.50.

This book is an addition to elementary works on electrical appliances. The style of the work is quite similar to that of many which have been written in the past ten years on steam engines and boilers. The method of explanation followed may be illustrated by a quotation from the chapter on armatures. "The style of armature shown in the cut can be best understood by taking it to pieces, and we will suppose that we are going to do so. We will place it in position where we can get at it handily and turn it around on its bearings. A close examination of it as it lies shows a shaft, and we presume that the shaft runs clear through from end to end, for we find that both ends are of the same size and of the same kind of metal. Next we find at the left an iron collar fitting quite closely to the end of some copper strips, which appear to be separated from each other by a substance of a different nature. We will take this collar off; it is screwed on. A spanner wrench loosens it, etc." This edition has an important addition on alternating current apparatus, which is written in the same simple style as the body of the book.

Probably to mechanical engineers the most interesting chapter will be that on electric motors. Considerable theory of the action and power of the motors is given. The method of winding is explained by diagrams, and there are a number of valuable directions pertaining to the starting and running of motors which will prevent injury to the apparatus, and, if followed, will enable a layman to care properly for electrical machines. We do not know of any other book in which the fundamental principles of electric dynamos and motors are reviewed in such simple style.

Lightning; A Weekly Review of Electricity. Faraday House, Charing Cross Road, London, W. C.

This new venture in the field of electrical journalism looks promising. It is proposed to make it newsy and rather popular, and the articles are generally very short. The editor proposes to publish in each issue a glossary of technical terms covering any new words that may appear in that issue. Single numbers are sold for two pence.

Messrs. John Wiley & Sons announce as in preparation *Part III. of Roofs and Bridges—Bridge Design*, by Professor Mansfield Merriman.

TRADE CATALOGUES.

The Von Borries Intersecting Valve.—Mr. Geo. L. Fowler, 53 Broadway, New York, has issued a circular containing an illustrated description of the working of the Von Borries intersecting valve as applied to compound locomotives and a few rules for the proportioning of compound locomotives.

TECHNICAL.

Manufacturing and Business.

On Nov. 9 Judge Gresham, of the United States Court at Chicago, decided in favor of the defendant in the case of Pettibone, Mulliken & Co. et al. vs. Arthur L. Stanford, for alleged infringement of certain railroad lifting jack patents.

The Buffalo Seal & Press Co., Buffalo, N. Y., is now turning out one and a half millions a week of the Boughton car seal. The firm states that since the business was organized four years ago no road has ever withdrawn its custom. This seal is used by the United States and by the Canadian, English and other foreign governments. The press works with a roller motion, and can be produced only by special machinery, so that, it is claimed, counterfeit presses cannot be made by means of a wax impression of a seal.

Greenlee Bros. & Co., of Chicago, have just sold a large order of wood-working machinery to the West India Improvement Co. for its shops on the Island of Jamaica.

Iron and Steel.

The four blast furnaces of the Pennsylvania Steel Co., at Steelton, Pa., are now in blast, No. 4 stack having been blown in last week. Three stacks are running on Bessemer iron, and the third is making spiegel.

The Linden Steel Co., of Pittsburgh, is building a new 25-ton open hearth furnace in its mill, and also putting in Siemens gas producers to supply fuel.

It is stated that the Southern Steel Co. of Chattanooga will greatly enlarge its department for the making of steel by the Bessemer basic process, erecting two 10-ton converters.

Morris Adler and William Berney, of Birmingham, Ala., and J. N. Carpenter, of Natchez, Miss., have purchased the Bessemer Rolling Mill for \$100,000, and will, it is stated, enlarge it.

The South Chicago Steel Casting Co., of Chicago, recently organized and will manufacture steel castings. The incorporators are: Frederick Arndt, C. M. Walker, and A. F. Evans.

The stockholders of the Eagle Iron & Steel Co., of Ironton, Ohio, recently organized to operate the old rolling mill at that place, elected the following directors: H. A. Marting, S. B. Steece, Joseph Fisher, George B. Davis, W. D. Jones, Lewis Jones, C. H. Ketter, A. Winters and F. C. Tomlinson. The board organized by electing H. A. Marting, President; S. B. Steece, Vice-President, and F. C. Tomlinson, Secretary and Treasurer.

S. R. Smythe & Co., of Pittsburgh, Pa., have closed a third contract with the Pennsylvania Tube Works for additional furnaces of special design by S. R. Smythe. They will be capable of turning out welded pipe ranging from 24 in. to 30 in. in diameter.

The Carbon Iron Co., of Pittsburgh, turned out last week on one head a screw for a lathe for the William Sellers Co., incorporated, at Philadelphia, to be used in manufacturing lathes for the Ordnance Department. The screw was 23 ft. long, 6½ in. square and weighed 10,800 lbs. It was made in one heat from a 20-in. square ingot.

Ritter & Conley, of Pittsburgh, have secured the contract from Carnegie Bros. & Co., Ltd., for all the iron work to be used in the construction of Furnace A, being rebuilt at Bessemer, Pa. The new furnace will be 14 x 75 ft. and larger than the old one. This furnace is operated exclusively on spiegel.

The Rail Market.

Steel Rails.—The Pennsylvania order has not been followed by any other large order, and the Eastern mills report a dull market. The *Iron Age* states that in the last two weeks two Chicago mills have received orders for 175,000 tons of rails, which will keep the mills busy for three months. The November report of the Board of Control is given in the same journal. It shows shipments up to Nov. 1 of 899,986 gross tons, standard sections, and orders booked up to the same date for 1891 delivery amounting to 1,062,073 tons. The deliveries during October were 100,030 tons, and the sales 85,537 gross tons. Quotations remain steady at \$30@30.50 at Eastern mills.

Shop and Station Notes.

Mr. L'Hommedieu, of New York, has been awarded the contract for the new station of the Central of New Jersey at Elizabeth, N. J. The building will be of quarry-faced stone for the lower course and the upper will be of yellow glazed brick. The station will be 90 x 23 ft., and will be surmounted by a tower rising 78 ft. from the ground. Two waiting-rooms, 22 x 26 and 20 x 26; a ticket office, 26 x 12, and the telegraph office will occupy the ground floor. An auxiliary station will be erected on the opposite side of the track for westbound passengers, and will be connected with the main building by two tunnels under the tracks. Both buildings will be heated by steam.

The Northern Pacific will soon let the contract for building a passenger station at Billings, Mont. That part of the building in which the telegraph offices are located will be two stories in height, the operators occupying the second story. The station will be 88 x 24 ft., will be constructed of brick trimmed with stone, and will be roofed with sheet steel laid with standing seams.

Superintendent Tait, of the Canadian Pacific, has informed the Esplanade Committee, Toronto, that the arrangements for building the new Union Station have been practically completed, which is taken to mean that work may go on at an early date.

The Owensboro, Falls of Rough & Green River Railroad, it is stated, will erect several additional buildings at its machine shops, at Owensboro, Ky., and equip the same with new machinery.

A Power-House will be erected at Curtis Bay, Md., by the South Baltimore Electric Railroad Co. It will contain a steam plant of 300 h. p.

The Atlantic Coast Line contemplates the erection of a grain elevator at Wilmington, N. C., the site for which has already been selected.

The Texas & Pacific contemplates the erection of a repair shop at El Paso, Tex.

Tin.

The Cincinnati Corrugating Co., of Piqua, O., are building an addition to their works for the announced purpose of making "bright orterne" tin plates of the highest grade. For this purpose they have ordered 1 pair cold rolls from A. Garrison & Co., Pittsburgh; 4 annealing boxes from McKeesport, (Pa.) Machine Co.; 4 Morewood tinning pots; 1 five-roll Morewood tinning machine; 1 pump for liquid tin; complete kits of tinman's and washman's tools; shaftings, pulleys, fire and red brick, cement, lime, castings, bolts, etc., to erect a complete tinning "Stack." The steel sheets are to be rolled by the Piqua Rolling Mill Co.

Contract for Iron Dock in Cuba.

Anderson & Barr have just closed the contract with the Sigua Iron Co. for constructing an ore dock and chutes for the loading of ore from cars to vessels near Santiago de Cuba. Mr. Anderson sailed with men and machinery Thursday last.

New Canadian Steel Steamer.

The Canadian fisheries cruiser, H. M. S. "Constance," built for the Dominion Government by the Polson Iron Works, of Owen Sound, Ont., was launched last week. She will be employed for the protection of the fishing industry in Georgian Bay. Her dimensions are: Length, 125 ft.; beam, 19½ ft.; depth of hold, 11½ ft. The boiler is 10½ ft. in diameter, 11½ ft. long, and bears pressure of 110 lbs. of steam. The engines are compound, with 18 and 36 in. cylinders, with a 24 in. stroke. The wheel, 8½ ft. with a 13 ft. pitch. The terms of the agreement provided for a speed of 11 knots per hour, but she has been

built to make 13. She draws 9½ ft. of water, and has a coal capacity to steam 2,000 miles. She is adapted for carrying quick firing guns.

The Tampico Harbor Improvement.

Mr. E. L. Cortbell, who has charge of the harbor improvements at Tampico, Mex., in a report in the *Mexican Financier*, states that the jetty work is now practically finished to about 1¼ miles from land, leaving 400 ft. yet to build to complete the jetties. Work has been conducted vigorously during the last year by contractor J. H. Hampson. Although there has not been the usual force of current in the river this year, owing to the dry season, there has been obtained a mean depth of 20 ft. the entire length of the jetties, and there are depths of over 30 ft. in places more than 6,000 ft. from land, where one and one-half years ago they had but 9 ft. of water. In comparing the depth of water in June and October they found that in four months the river had excavated 1,035,000 cubic yards of sediment. There are now 11 ft. of water on the crest of the bar, and this week they took a 10-ft. barge, heavily loaded, over the bar. Mr. Cortbell, while in Europe recently, examined the exposed harbors on the North Sea at Amsterdam and Rotterdam. The jetties at the mouth of the river Maas, at the latter place, are mattress jetties similar to those building at Tampico, and have been in existence for 15 years; in this time the cost of maintenance has been but \$8,000 per year although they are in a very exposed position. The bar at the mouth of the Brazos River, Texas, has just been successfully removed by the completion of works similar to those in progress at Tampico. A depth of 18 ft. on crest of bar was reported on Oct. 1, last.

Metallic Cement.

Some attempt is being made to draw the attention of English cement makers and builders to the merits of mastic or metallic cement. The French are the principal producers and users of this material, and they have made its manufacture a somewhat important branch of native industry. The composition of the material varies according to the different producers, and the formulae are, in most cases, more or less trade secrets. Oolitic limestone, sand, litharge and a little linseed oil are, however, the best recognized ingredients, and the principal variations in the composition of the cement are due to the different proportions of these ingredients and the addition of small quantities of metals, iron, lead, zinc, etc. As much as 10½ per cent. of white lead is sometimes used with ordinary cement as the basis substance. The value of the material seems to have been proved by its extensive and increasing adoption in building and engineering all over France, and it has very largely diminished the import of Portland cement from England. There are over 20 makers of metallic cement in Paris alone. The material acquires extraordinary hardness after a short period of exposure, and its trustworthiness is attested by the fact that the French Government Department of Bridges and Roads has taken it into general use. The composition of the material employed by the department is mainly remarkable for the presence of a considerable quantity of zinc. In another preparation cast-iron filings or copper are employed, the former being considered to give the best results.—*Ironmonger.*

The Industrial Works of Bay City.

Among the latest orders to be taken by the Industrial Works of Bay City, Mich., are several for cranes of different types. These embrace a large steel transfer crane for the Chicago & Alton; a 10-ton portable steam crane for a firm in Worcester, Mass.; an electric traveling crane for the American Engine Co., of Bound Brook, N. J.; a stationary steel crane for the New York Central & Hudson River; a 15-ton portable crane for the West India Improvement Co., and a steel car and cranes, with a capacity for lifting 30 tons, for the Central Railroad of New Jersey. Other recent orders include three turntables for the Kansas City, Watkins & Gulf; a portable extension steam pile driver for the New York Central & Hudson River road; a steam transfer table for the Wheeling & Lake Erie, and a similar table for the Grant Locomotive Works of Chicago.

The Industrial Works has just completed a new electric plant, which will be used in lighting the various shops and for power purposes, and has also commenced erecting a new building which will have a frontage of 100 ft. and extend back a distance of 270 ft. This building will be devoted principally to crane work, and will be completely equipped with electric traveling and other cranes, and modern machinery. With the completion of this addition the present plant of this company will be somewhat relieved and the total capacity of the works greatly increased.

An Electric Railroad of 149 Miles.

Of the proposed electric railroad between Budapest and Vienna, recently noticed in the *Railroad Gazette*, further details are given in a late number of the *Verkehrs Zeitung*. According to these, there will be for the 240 kilometres (149 miles) of road two main power stations with 100 substations, and only three or four stopping places. The cars will be 40 metres (about 131 ft.) long, and will be fitted with four two-axle bogie trucks. At each end of a car there will be two large electric motors, to which the current will be transmitted by contact wheels running on conductor rails. The speed which it is proposed to attain in regular working is 200 kilometres (124.2 miles) per hour, and, in order to diminish the air resistance the ends of the cars will be shaped like ships' bows. The distance between Vienna and Budapest is to be covered in 75 minutes, and cars are to be run at quarter-hour intervals. Up to the present, permission to build the road has not been granted by the authorities, but there is thought to be little doubt that the line will be taken in hand in the near future.

The Single Expansion Engine.

There has been some discussion regarding the name for the ordinary locomotive when speaking of it in connection with the compound. Those who have been troubled to find a satisfactory word seem now to favor "single expansion." This term is better than "ordinary engine," "standard engine," "simple engine" and "single engine," which have been used by different writers.

Test of Pintsch Gas Light.

A test was made on the Chicago & North Western at Chicago last week of the amount of Pintsch oil gas burned in a car. There were five lamps with four burners each. With the gas turned on to a height that would satisfactorily light the interior of the cars, the amount of oil consumed in an hour was 15 cubic feet, or ¾ of a cubic foot by each jet in an hour. These tests were made by a gas meter, which was standardized by the Chicago Gas Co., and were conducted by Mr. D. L. Barnes for the Chicago & South Side Rapid Transit Railroad.

THE SCRAP HEAP.

Notes.

The strike of locomotive engineers and firemen at St. Louis has again been settled.

At Marcon, France, Nov. 11, a railroad train was blown from the track by a high wind.

Last Friday the Eastern division of the Erie surpassed all its former records by moving 1,750 loaded cars east and 1,570 cars west.

During the past season the Vulcan Iron Co., of Winnipeg, Man., has erected upward of 40 grain elevators in various parts of Manitoba.

The Union Switch & Signal Co. has erected a 13-lever interlocking plant for the Wheeling, Bridge & Terminal Railroad, at Wheeling, W. Va.

There was a severe storm in the State of Washington last week, and the Western Pacific was damaged by washouts to the extent of \$50,000.

Charles W. Reen, of Philadelphia, has sued the Philadelphia & Reading for not carrying out a contract under which he was to publish a history of the road.

The Southern Pacific has presented gratuities to 28 section foremen in appreciation of their work in repairing the road after the overflow of the Mississippi River, near New Orleans, last year.

The yard trainmen of the Wheeling & Lake Erie at Toledo struck last week. At last accounts the difficulties were still unsettled. There was a similar strike on the St. Paul, Minneapolis & Sault Ste. Marie, at St. Paul.

The Railroad Commissioners of Missouri have issued a circular to the roads of the state, reminding them that the law requiring every station to have a bulletin showing the delays of passenger trains is not being complied with.

An order has been issued on the Erie to observe Rule 48 of the Standard Code on double as well as single track. This rule requires a whistle signal to be given by trains when displaying signals for a following train, to call the attention of trains of the same or inferior class to the signals displayed.

There is an ordinance which prohibits trains from running through Oakland, Md. (on the Baltimore & Ohio), faster than six miles an hour. Last Saturday evening the engineer of the Chicago express was arrested for violating this ordinance, and the train was delayed until the case was heard by a justice. The engineer was fined and then allowed to go to his train.

In the matter of the accident at a crossing of the Staten Island Rapid Transit Railroad on Oct. 6 last, resulting in the death of three persons and serious injury to another, the New York State Board of Railroad Commissioners has recommended that the embankment on the west side of the crossing be cut down; that the company confer with the owners of the woods in the angle on the east side of the tracks with a view to having them cut down so as to give a clear view from the crossing of southbound trains; that an electric bell be erected and placed in operation at this crossing, and at all unprotected crossings on the line of the road where there is not a clear view of at least a quarter of a mile.

World's Fair Notes.

A company has been formed in Chicago to run a line of excursion steamers to Jackson Park during the exposition. They claim that they will be able to transport 17,000 visitors per hour to the grounds. The boats are to be converted into hotels at night and will furnish sleeping apartments for 7,000 persons.

The contract for the roofing of Machinery Hall was awarded to Louis Biegler for \$135,000. All iron for the Mines building is on the ground and the iron work will be completed within a week. The Horticultural building is waiting for iron. Material for the dome of the Administration building is on the ground and the four pavilions are finished to the line of the third story. The floor of the Agriculture building is finished and work has begun on the superstructure. A large force of masons and carpenters is at work upon the Art building.

The Council of the Society of Arts, which is the Royal British World's Fair Commission, after listening to the highly favorable report of the Commissioners, Sir Henry Wood and James Dredge, relative to their investigation of Exposition matters at Chicago, decided to appoint committees on finance, fine art, Indian, colonial, engineering, manufactures, electricity, agriculture, mines and metallurgy, textile industries and transportation, and also a committee on women's work. It also voted to invite the assistance of chambers of commerce and local committees throughout England.

A number of changes have been made in the plans just south of the Liberal Arts Building. At the end of the long pier, which is completed and extends 1,000 ft. into the lake, will stand an iron tower, covered with staff, and rising 250 ft. above the water. From its top electrical displays may be made and search lights will illuminate portions of the grounds on fête nights. As a substitute for the abandoned casino on the pier there will be a large Music Hall to accommodate 3,000 people. The popular concerts in the spring will be held in an amphitheatre accommodating 15,000 people at the south end, which will after the festivals be used for live stock exhibits. In place of the curved mole, there will be a peristyle 60 ft. wide and 500 ft. long, extending north and south and spanning the lagoon by a large arch. These changes will be completed at a less total cost than that of the original plan.

Mr. Takahira, Japanese Consul-General in New York, who was specially commissioned by the Mikado to look into Exposition matters, has made a formal application to Director-General Davis for 124,100 square feet in the several buildings and on the Midway Plaisance, as follows: For an official Japanese building, 40,000 sq. ft.; in the Manufacturer's Building, 35,000; Agricultural Building, 4,000; Fine Arts, 2,000; Mines and Mining, 750; Forestry, 350; Bazaars, 42,000. Mr. Takahira was formerly secretary of the Japanese legation at Washington, and speaks English fluently. He says the Japanese will soon make a very large appropriation for participation.

A very interesting feature of the Montana exhibit will be a relief map of Butte and vicinity. Owing to the nature of the ground there and the fact of its being the greatest of mining camps, anything of this nature will prove specially noteworthy from a geological standpoint.

The Paris Seaport Scheme.

The committee appointed to consider the project of making Paris an inland seaport has handed in its report to the municipal authorities of the French capital. The great canal which it is proposed to construct between Paris and Rouen would be 182 kilometres, or 114 miles

long, and 6.2 metres, or nearly 21 ft. deep. For large ships a port would be built between St. Denis and Clichy, and smaller ports would be constructed at Audelys, Vernan, Poissy, Achères and Argenteuil. The cost of the undertaking is estimated at 150,000,000 francs or \$35,000,000.

D., L. & W. Office Building.

Plans for a new office building to be erected by the Delaware, Lackawanna & Western in New York City, on the site of its old building, corner of Exchange place and William street, have been approved by the directors. The building which is to be torn down is a five story brick structure, which has long been too small for all the offices. The new building will be ten stories high, and 150 ft. high above the street level. It will be nearly square, fronting 53½ ft. on Exchange place, and 79 ft. on William street. The new edifice will be built of Indiana limestone. The interior of the building will be handsomely decorated. The entrance on Exchange place will open into a marble hall paved with mosaic.

The interior construction will be on the steel framework plan used in Chicago's tall buildings and recently adopted by builders of tall structures in New York City; that is a system of steel posts and girders, supporting the entire weight of the floors, and relieving the walls of all strain. All the offices in the building will be used by the railroad company. The building is to be ready for occupancy next August. The architect is C. L. Holden.

Railroads Assisting the Farmers.

On account of the enormous crop of wheat in the Northwestern States this year, there was a great scarcity of threshing machines. In order to help the farmers to save the crop, the railroads reaching the wheat belt in the far north carried threshing outfits to the wheat fields, together with a crew of ten men with each machine, free. This arrangement was made several weeks ago, and every effort put forth to procure the necessary machines from the localities in which the grain had been threshed. As the wheat was still in the shock and the farmers have no facilities for storing or threshing it, the situation was alarming, because rain or snow would cause the grain to sprout, making it worthless. A large number of machines were taken out by the various roads, probably the greatest number being carried by the Great Northern. This company had transported, up to November 1, 163 complete threshing outfits. Each of these machines is capable of preparing for market 1,800 bushels of wheat every twelve hours. This means three carloads per day for each outfit, or a total for the machines carried by this company alone of 500 carloads for each twelve hours' work.

LOCOMOTIVE BUILDING.

The South Carolina road is also in the market for locomotives.

The Old Colony has let a contract for 10 passenger engines to the Manchester Locomotive Works.

The Chicago, Burlington & Quincy is in the market for new engines. The number is reported to be 26.

The International & Great Northern has ordered 10 ten-wheel locomotives from the Cooke Locomotive Works.

The Manhattan Elevated has awarded the contract to the Pittsburgh Locomotive Works, Pittsburgh, Pa., for building 20 new engines.

The Canadian Pacific workshops at Winnipeg are very busy. Five standard engines, transferred from eastern points, have already been put into service at Winnipeg, and two moguls have been built at Fort William. Seven new 10-wheel engines will be added to the equipment this week. These engines have a haulage capacity one-third greater than the standard engine.

CAR BUILDING.

The Queen & Crescent is in the market for 400 box cars, to be used on the Alabama Great Southern division. The contract will probably be let next week, and it is expected that the order will go to the Ohio Falls Car Co.

The Souder Railway Freight Car Co. has been incorporated at Newport, Ky., by John S. May, Philip Engleskirger and E. E. Hughes, to manufacture freight cars under the patent of Jacob J. Souder, of Washington, D. C. The capital stock of the company is \$2,000,000.

The Queen & Crescent is to put in service in the early part of December two new vestibule trains, the cars for which were built by the Barney & Smith Mfg. Co. The two trains will be vestibuled throughout with the Barr vestibule. One train will run between Cincinnati and Jacksonville and the other between Cincinnati and New Orleans.

The Barney & Smith Mfg. Co., of Dayton, O., is building the following passenger cars: 30 for the Queen & Crescent route, 30 for the Chesapeake & Ohio, 25 for the Lake Shore & Michigan Southern, 25 for the Cincinnati, Hamilton & Dayton, and 19 sleeping cars, mahogany finish, for the Canadian Pacific. The Cleveland, Cincinnati, Chicago & St. Louis' order for 50 passenger cars is reported to have been awarded to this firm.

The St. Charles Car Co. has completed six very handsome passenger cars for the Wabash road. They are 64 ft. long, mahogany finish, with a smoking-room, and have six-wheel trucks. They are considered by car builders the most substantial cars in the West. They are for trains running between St. Louis and Toledo and Kansas City and St. Louis. A train of cars for the Central & Chester consisting of a first class car, smoker and baggage and express car. The Texas & Pacific order for 400 coal cars will go out of the shops at the rate of 15 cars a day next week.

BRIDGE BUILDING.

Bristol, Tenn.—An iron bridge will probably be erected across Beaver Creek, at Bristol, Tenn.

Camden, N. J.—The local Board of Freeholders has approved plans for the proposed \$18,000 bridge over Cooper's Creek, at Federal street.

Crystal Falls, Mich.—The Buchanan Bridge Co. has received a contract for building a bridge at Crystal Falls.

Edna, Tex.—The County Commissioners at Edna have awarded contracts for the construction of four additional iron bridges across the Lavaca and Navidad Rivers.

Elkton, Md.—The County Commissioners are inviting estimates on the construction of two bridges over Stony Creek.

Grayville, Ill.—A new steel bridge is to be erected by the Peoria, Decatur & Evansville across the Wabash River at Grayville, Ill.

Groton Bridge Co.—The Groton Bridge & Mfg. Co., of Groton, N. Y., has the contract for a bridge at Caribou, consisting of three spans, each 150 ft., with 18 ft. roadway. Also for two spans, 81 ft. each and 16 ft. roadway, at Wytotitlock, between Penobscot and Aroostook counties. Both of these bridges will have cylinder pier foundations. Shop work will soon be commenced on four spans, 76, 82, 108 and 126 ft. long, including two draw spans for Brazoria County, Tex. Also a 228-ft. span for Shenandoah County, Va. Large bridges at Newaygo, Mich., four 110-ft. spans and Marble Falls, Tex.; one 270-ft., two 150-ft. and one 110 ft. spans are in process of erection. This company has also a large number of smaller spans under contract.

Jacksonville, Ala.—J. De Arman, of Jacksonville, is inviting bids for building two bridges, one at Bushes, over Crane Creek, the other at Reeds, over the Ochatsee River. These are to be of either iron or wood. Plans and specifications are to accompany each bid.

MacLeod, N. W. T.—Mr. Smith, contractor for the bridge being erected at MacLeod, states that the bridge proper is completed, and the approaches will be completed in about a fortnight. It took a quarter of a million feet of timber, all of which was obtained at the mill at MacLeod, except 36,000 ft. which had to be shipped from the coast. This lumber cost nearly double that obtained on the spot.

Memphis, Tenn.—A contract has been awarded for the construction of the bridge over Gayoso Bayou, at Mill street, to cost \$9,000.

Saginaw, Mich.—The Board of Public Works has been ordered to prepare plans and specifications for the Court street bridge and that at Carrollton in accordance with the general plans already submitted to the Board of Supervisors, bids for which will be received Dec. 1. The Genesee avenue bridge will be utilized in the construction of the bridge at the south side.

Warden, Ill.—The contract for building a bridge across Cahokia Creek at Warden has been awarded to the Missouri Valley Bridge Co.

Westminster, Vt.—The following bids were received for a bridge, 270 x 18, over Saxton's River: Pittsburgh Bridge Co., \$3,400; Berlin Iron Bridge Co., \$7,825; Groton Bridge & Mfg. Co., \$7,963; King Iron Bridge Co., \$7,985; Vermont Construction Co., \$8,293. The contract was awarded to the Berlin Iron Bridge Co.

Woodstock, Ont.—A. G. Beckwith, Provincial Engineer, and David Browne, assisted by a local staff, have been at Woodstock, N. B., during a portion of the week taking soundings of the river, to decide upon the site of the new bridge.

Yorkville, S. C.—The County Commissioners of York County, Yorkville, S. C., are preparing to award the contract for the construction of a bridge over Clark Fork.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Supreme Court of Iowa affirms the constitutionality of the "Joint rate" of that state. It holds that "Joint rates" within the meaning of the act are the sum of the rates established for each line for the transportation of freight over its road; that it is competent for the legislature to prescribe that loaded cars shall be transferred from one line to another without breaking bulk, unless at the expense of the company unloading them, and that the provision for attorneys' fees in actions under the act is valid.

In North Carolina a railroad was authorized to construct its road to a junction at C. with the C. & S. C. Ry., or with the N. C. Ry. It located its line so as to connect with the N. C. Ry., but, for a few months before the completion of its line, it ran its trains over the road of another company so as to connect at C. with the C. & S. C. Ry. The Supreme Court rules that this was not "a construction of its road to a junction with the C. & S. C. Ry." which deprived it of its election to connect with the N. C. Ry. Under a charter authorizing a railroad company to connect with another "at the city of C.," the connection may be made at a point 1,000 yards beyond the city limits.

In the same state it is held that an unrecorded agreement by a land owner to relinquish to a railroad company a right of way through his lands in consideration of the advantage to be derived from the construction of the road does not vest the title to the right of way in the company, where it puts up a grade only and then abandons work for 25 years; and the company cannot claim such title under the law providing that a railroad company shall not be barred of its real estate, right of way, easements, etc., "which may have been condemned or otherwise obtained" by any statute of limitation or adverse occupancy.

The New York Court of Appeals rules that the omission of a railroad company for five days to run its trains is not an "abuse of its powers" within the meaning of law (§ 1793), which authorizes an action for dissolution for abuse of corporate powers.

The New York, Lake Erie & Western Railroad Co., a foreign corporation, was permitted by Pennsylvania statutes to build a portion of its road in the state on payment of \$10,000 annually to the state after its completion. The Supreme Court of that state holds that the act of June 30, 1885, taxing the indebtedness of corporations doing business in the state, and compelling them to collect such tax, applied to such company, and did not impair the obligation of the contract between the state and the corporation, as set forth in the above private statutes.

The Supreme Court of Virginia decides that the state statute forbidding the running of trains on Sunday between sunrise and sunset, except wrecking, passenger, stock and United States mail trains, conflicts with the article of the Constitution of the United States providing that Congress shall have power to regulate commerce among the several states, and is void as to trains running between points in different states.

In Texas it is ruled by the Supreme Court that where a railroad employed attorneys in a particular case, and before the determination thereof the road was leased and operated by another company, the fact that the latter company continued to receive the services is sufficient to sustain a finding that it ratified the original employment.

In Alabama the Supreme Court holds that changing the site of a depot from one place to another in the same town is not abolishing it, within the meaning of the law

of 1890 forbidding the abolishment or disuse of any depot, when once established, without the consent of the railroad commission; but such change can only be made when the interests of the railroad company and the public concur in demanding it, and when the new site is not inconvenient or inaccessible.⁸

The Supreme Court of Pennsylvania rules that when the equipment of a domestic railroad corporation is used interchangeably upon its lines within and without the state, its capital stock can only be taxed in the proportion that the number of miles operated and equipped in one state bears to the entire mileage.⁹

In the same state, it is held that the sum which one railroad company receives from another which uses its tracks as compensation therefor is a toll, within the meaning of the law of 1879, which imposes a certain tax on the gross receipts of a railroad company "for tolls and transportation."¹⁰

Carriage of Goods and Injuries to Property.

The Supreme Court of Mississippi rules that a mere switch, at which there is neither agent, station nor platform, but where shipments are made by loading upon cars placed on the side track by request, is not a depot, at which a deposit of goods alongside is such a delivery to the company as will make it liable as a common carrier.¹¹

In Texas the Supreme Court holds that under the state statute requiring railroad companies to erect at every depot or place established by the company for the delivery and reception of freight suitable buildings and inclosures to protect freight of every description from damage, a railroad company cannot avoid liability by showing that pens erected by it for the shipment of cattle are so badly kept or constructed as to make it contributory negligence for the shipper to use them.¹²

The Supreme Court of the United States decides that a carrier of live stock cannot make a valid agreement to receive and deliver all stock consigned to it exclusively at and through the stock yards of another corporation, and to charge the shipper or consignee, for the benefit of such corporation, a certain amount for the use of its yards, in addition to charges for transportation.¹³

In Texas it is held by the Supreme Court that in an action for damages against a railroad for running its trains along the street in front of plaintiffs' property at a greater rate of speed than is allowed by the ordinances of the city, and for failure to station flagmen at street crossings adjacent thereto, as required by the ordinances, and for frequently permitting cars loaded with cattle and manure to stand in front of the premises for a considerable length of time, whereby the stench from said cars pervaded the house, creating sickness in the family, there can be no recovery for depreciation of the value of the property caused thereby, the proper measure being such special damages as may accrue up to the time of trial.¹⁴

The Supreme Court of Missouri decides that the statute of that state providing that when a carrier receives property to be transferred from one place to another, within or without the state, or when it issues receipts or bills of lading in the state, it "shall be liable for any loss, damage or injury to such property, caused by its negligence or the negligence of any other common carrier, railroad or transportation company to which such property may be delivered or over whose line such property may pass," and that the carrier issuing the receipt or bill of lading may recover the amount which it may be required to pay the owner of the property from the carrier whose negligence caused the loss or injury, is constitutional.¹⁵

In Texas the Supreme Court holds that under the statute forbidding common carriers to limit their liability at common law by inserting exceptions in the bill of lading, a railroad company which transports goods within the state, but fails to deliver them, is liable for their value at the place of destination, less transportation charges, although the bill of lading provides that, in event of loss, the value or cost at the point of shipment shall govern the settlement.¹⁶

In Alabama the Supreme Court rules that the sudden and unprecedented overflow of a river is such an act of God as will relieve a railroad company from liability for damage to freight, caused thereby, if, after knowledge of the danger, the company did not unnecessarily expose it, but made all effort to save it.¹⁷

The Supreme Court of Arkansas decides that a shipper of horses, who is present, and allows a connecting carrier to receive his horses from a prior carrier, and pay the previous charges, so as to have a lien on the horses, cannot set off against the claim of such carrier damages for the killing of horses while in the hands of the prior carrier, though the connecting carrier knew of the loss, and that the shipper intended to demand damages from the previous carrier.¹⁸

In Texas the Supreme Court holds that one carload of lumber is of "like quantity" with another, within the Texas statute forbidding railroad companies to discriminate in their freight charges, though the two carloads are of different weight and dimensions.¹⁹

Injuries to Passengers, Employees and Strangers.

The Supreme Court of Minnesota decides that where a conductor ejects a passenger at an intermediate station for refusing to pay the full fare to his destination, he may retain out of the sum actually paid an amount equal to the fare to the station where the passenger is ejected. But such ejection is wrongful when the conductor puts the passenger off before he returns to him the difference between the sum paid and the fare he is entitled to retain, even though he returns it immediately after the ejection.²⁰

In New York the Supreme Court rules that a person who enters an elevated railroad car at a station, and looks leisurely around without taking a seat, and is thrown down by the inevitable "jerk" of the train in starting, is guilty of contributory negligence, and cannot recover for an injury thereby sustained.²¹

In Alabama a brakeman was injured while in discharge of his duties, and a physician was called by the conductor to attend him. The conductor had no express authority to employ physicians in such cases, and it was not shown that the necessity for medical attendance was urgent and immediate, that communication with the chief officers in regard to such employment was impracticable, or delay for that purpose dangerous, or that the general superintendent knew of the employment until after the services had been rendered, and it appeared that there was telegraphic communication with him. The Supreme Court rules that the company was not liable for such services.²²

In New York the Court of Appeals decides that when the rules of the railroad require car repairers to see that they are protected by a certain flag when under and between the cars, and require all employees to acquaint themselves with the rules, and keep a copy of them, and such rules are posted on bulletin boards, and printed on

the back of time tables, and kept for distribution at all points where employees can get them, such rule is sufficient for the protection of a car repairer working under a car, though it does not expressly prohibit or the servants from moving other cars against cars protected by the flag.²³

- ¹ B. C. R. & N. R. Co. v. Dey, 48 N. W. Rep., 98.
- ² Purifoy v. Richmond & D. R. Co., 12 S. E. Rep., 741.
- ³ Beattie v. Carolina Cent. R. Co., 12 S. E. Rep., 913.
- ⁴ People v. Atlantic Ave. R. Co., 26 N. E. Rep., 622.
- ⁵ Com. v. N. Y., L. E. & W. R. Co., 22 Atl. R. p., 212.
- ⁶ N. & W. R. Co. v. Com., 13 S. E. Rep., 340.
- ⁷ T. & G. N. R. Co. v. Clark, 16 S. W. Rep., 631.
- ⁸ State v. Ala. & V. Ry. Co., 9 South Rep., 469.
- ⁹ Commonwealth v. D. L. & W. R. Co., 22 Atl. Rep., 157.
- ¹⁰ Commonwealth v. N. Y., P. & O. R. Co., 22 Atl. Rep., 212.
- ¹¹ K. C. M. & B. R. Co. v. Lilly, 8 South Rep., 644.
- ¹² Gulf, C. & S. F. Ry. Co. v. Trawick, 15 S. W., 568.
- ¹³ Covington Stock-Yards Co. v. Keith, 11 S. (t. Rep. 461.
- ¹⁴ Baugh v. Texas & N. O. R. Co., 15 S. W. Rep., 587.
- ¹⁵ Dimmitt v. K. C., St. J. & C. B. R. Co., 15 S. W. Rep., 761.
- ¹⁶ Gulf, C. & S. F. Ry. Co. v. Borton, 15 S. W. Rep., 909.
- ¹⁷ Smith v. W. Ry. of Alabama, 8 South. Rep. 734.
- ¹⁸ St. Louis, I. M. & S. Ry. Co. v. Lear, 15 S. W. Rep., 1,030.
- ¹⁹ N. Y., T. & M. R. Co. v. Gallagher, 15 S. W. Rep., 694.
- ²⁰ Wardwell v. C. M. & St. P. Ry. Co., 20 N. W. Rep., 206.
- ²¹ De Souze v. Manhattan Ry. Co., 15 N. Y. S., 108.
- ²² Sevier v. Birm., S. & T. R. Co., 9 South Rep., 465.
- ²³ Corcoran v. D. L. & W. R. Co., 27 N. E. Rep., 1,022.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Alabama & Vicksburg*, 3 per cent., payable on demand.
- Baltimore & Ohio*, 20 per cent. on the common stock, payable Dec. 31.
- Chicago, Burlington & Quincy*, quarterly, 1½ per cent., payable Dec. 15.
- Cleveland, Akron & Columbus*, 1 per cent., payable on demand.
- Kennebec Central*, 10 per cent.
- New York & Middle Coal Field Railroad & Coal Co.*, \$20 per share, payable Nov. 30.
- North Pennsylvania*, quarterly, 2 per cent., payable Nov. 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Alabama Great Southern*, special, Birmingham, Ala., Dec. 15.
- Atlantic & Danville*, annual, Portsmouth, Va., Dec. 15.
- Atlantic & Pacific*, annual, 95 Milk street, Boston, Mass., Dec. 10.
- Boston & Maine*, annual, Lawrence, Mass., Dec. 9.
- Charleston, Columbia & Augusta*, annual, Columbia, S. C., Dec. 2.
- Columbia & Greenville*, annual, Columbia, S. C., Dec. 3.
- Eastern (Mass.)*, annual, Boston, Mass., Dec. 9.
- Georgia Pacific*, annual, Birmingham, Ala., Nov. 25.
- Keokuk & Western*, annual, Keokuk, Ia., Dec. 3.
- Memphis & Charleston*, annual, Memphis, Tenn., and Huntsville, Ala., Nov. 30.
- New York, Lake Erie & Western*, annual, 21 Cortlandt street, New York City, Nov. 24.
- Richmond & Danville*, annual, Richmond, Va., Dec. 2.
- Richmond & West Point Terminal*, annual, Richmond, Va., Dec. 18.
- Rome, Watertown & Ogdensburg*, annual, Grand Central Station, New York City, Dec. 28.
- South & North Alabama*, annual, Montgomery, Ala., Nov. 28.
- Suspension Bridge & Erie Junction*, annual, 21 Cortlandt street, New York City, Nov. 24.
- Utica & Black River*, annual, Grand Central Station, New York City, Dec. 28.
- Virginia Midland*, annual, Alexandria, Va., Dec. 16.
- Walkill Valley*, annual, 5 Vanderbilt avenue, New York City, Dec. 9.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.
- The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.
- The *New York Railroad Club* holds regular meetings at its rooms in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.
- The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.
- The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.
- The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.
- The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.
- The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.
- The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.
- The *Western Society of Engineers* holds its regular meetings at 73 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.
- The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.
- The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.
- The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.
- The *Engineers' Club of Cincinnati* holds its regular

meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 21 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m., on the first Friday of each month.

American Society of Civil Engineers.

The following are the latest announcements of regular meetings:

Wednesday, Nov. 18: A paper on "The Experimental Determination of the Rolling Friction in Operating the Draw of the Thames River Bridge, etc.," by A. P. Bolter, Jr., and H. J. Schumacher.

Dec. 2: A paper will be presented, entitled "Some Disputed Points in Railway Bridge Designing," by J. A. L. Waddell, M. Am. Soc. C. E.

Dec. 18: A paper on "The Red Rock Centilever Bridge," by S. M. Rowe, S. W. Robinson and H. H. Quimby, members Am. Soc. C. E.

Jan. 6: A paper on "The Availability of the Canons of the Colorado River of the West for Railway Purposes," by Robert B. Stanton, M. Am. Soc. C. E.

Engineering Association of the South.

The annual meeting of the Association was held at Nashville, Tenn., Nov. 12. President John B. Atkinson, of Earlinton, Ky., presiding. Twenty-five members were present. Secretary Olin H. Landreth reported that the present membership of the Association was 95; associates, 3; juniors, 10; deaths during the past year, 2; resignations during the past year, 6; additions during the past year, 15. The following officers were elected: President, A. V. Gude, Atlanta, Ga.; First Vice-president, James Geddes, Nashville, Tenn.; Second Vice-president, F. P. Clute, South Pittsburgh, Tenn. Directors from Tennessee—W. L. Dudley, E. C. Lewis and W. E. Foster, of Nashville. Directors from other states—John McLeod, Kentucky; Charles B. Percy, Alabama; Hunter McDonald, Georgia. For Secretary, Olin H. Landreth, Nashville. For Treasurer, W. B. Ross, Nashville. Lucien S. Johnson, Peach Orchard, Ky., was elected as a member, and John Peebles, of Nashville, as junior member of the Association.

New England Railroad Club.

The subject for discussion at the December meeting of the club is to be "Tools and Machinery for Railway Shops." The meetings after this year are to be held bi-monthly, the following resolution having been passed at the last meeting: "The regular meetings of this club shall be held on the second Monday of each alternate month, commencing January, 1892, provided, however, that the meeting in July of each year may be omitted by vote of the club."

The Central Railway Club.

The Central Railway Club will meet at the Hotel Iroquois, in Buffalo, on Wednesday, the 25th inst., at 9:30 a. m. The subjects to be discussed are as follows: "Wheel Gauges and Wheel Defects;" "Wear of Break Shoes;" "Wrong Drawbars."

PERSONAL.

—Vice President Shaughnessy, of the Canadian Pacific Co., is going to China on business of the company.

—Mr. D. J. Mullaney, who has been District Passenger Agent of the Queen and Crescent route for the Southern District for about two years, has resigned, and has been appointed General Traveling Agent for the Western & Atlantic.

—Capt. John Irving, commodore and general manager of the Canadian Pacific Navigation Co., will leave for England shortly in connection with the purchase of a new steamer for the Canadian Pacific's fleet.

—Superintendent C. W. Risley, of the Pittsburgh, Akron & Western, whose headquarters have hitherto been at Delphos, has been appointed General Superintendent of that road with headquarters at Akron, O.

—Mr. John Taylor, the inventor of the Taylor Electric Motor Truck, who has been chief draftsman of the Gilbert Car Mfg. Co., of Troy, N. Y., has resigned that position. His present address is No. 98 Ninth street, Troy.

—The position which Ex-Superintendent R. W. Baxter, of the Baltimore & Ohio, will hold on the Union Pacific is Superintendent of the Oregon division. Mr. Baxter was formerly Superintendent of the Wyoming division.

—Mr. Thomas Anderson, who recently left the Pittsburgh & Western to become Master Car Builder of the Chicago & Eastern Illinois, has resigned the latter position to return to the Pittsburgh & Western as Master Car Builder.

—Mr. Ralph S. Greenlee, of the firm of Greenlee Bros.

& Co., the Chicago builders of wood-working machinery, has just returned from a two years trip around the world, on which he has combined considerable business with a great deal of pleasure.

—Mr. E. L. Cheneworth, night operator for the Wabash at Bluffs, Ill., has just been acquitted by a jury at Winchester, Ill., on a charge of murder. Mr. Cheneworth killed a man named Thompson, who was endeavoring to enter his office for the avowed purpose of assaulting him. The road bore the expense of the defense.

—Mr. James L. Mallette has been appointed Master Mechanic of the South Bound road. He was for a few years Master Mechanic of the City & Suburban road at Savannah. He served his apprenticeship in the shops of the Central of Georgia at Savannah, afterward running as a locomotive engineer on that road and the Savannah, Florida & Western.

—Mr. William H. Fenner, Jr., has been elected President of the Grant Locomotive Works at Chicago. Mr. Fenner's experience in the construction of locomotives extends over a period of about 20 years prior to 1887, when he resigned from the Rhode Island Locomotive Works to accept the presidency of the Alien Paper Car Wheel Co. Few men have more friends than Mr. Fenner in railroad and manufacturing circles, and the Grant Works have an able and experienced leader to start the new shops.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The annual meeting of the stockholders was held in Baltimore, Nov. 16, and on a vote of 112,031 shares these directors were elected: Charles J. M. Gwynn, James Sloan, Jr., William F. Burns, William H. Blackford, Aubrey Pearre, George De B. Keim, Wesley A. Tucker, Maurice Gregg, J. Wilcox Brown, William F. Frick, George A. von Lingen, George C. Jenkins.

Buffalo, Rochester & Pittsburgh.—The stockholders met in New York Nov. 16, and re-elected the old directors of the road, W. Emlen Roosevelt being chosen to fill the vacancy caused by the death of his brother, Alfred Roosevelt. The directors are: Frederick A. Bell, Wilson S. Bissell, Frederick A. Brown, Walston H. Brown, Edward N. Gibbs, R. M. Gummere, Adrian Ise, Jr., George H. Lewis, Wheeler H. Peckham, W. Emlen Roosevelt, J. Kennedy Tod, Warren A. Wilbur and Arthur G. Yates.

Chicago, St. Paul & Kansas City.—The headquarters of the General Roadmaster and Superintendent of Bridges and Buildings have been transferred from Dubuque, Ia., to the general offices of the company at St. Paul, Minn.

Duluth, Red Wing & Southern.—The following Directors were elected at the annual meeting on Nov. 11 at Red Wing, Minn.: F. W. Hoyt, G. H. Cray, S. B. Foote, T. B. Sheldon, L. F. Hubbard, C. E. Sheldon, Red Wing; M. J. Taber, Owatonna, Minn.; W. H. Twilford, Geneva, Minn.; A. T. Stebbins, Rochester, Minn.; W. A. Morin, A. M. Todd, Albert Lea, Minn.; W. C. Rice, St. Paul, Minn.; H. O. Powell, R. C. Morse, River Falls, Wis.; J. W. Park, Balsam Lake, Wis. The Directors chose the following officers: President, F. W. Hoyt; Vice-President, S. B. Foote; Secy., G. H. Cray; Treasurer, T. B. Sheldon; General Manager, L. F. Hubbard.

Montgomery & Eufaula.—The stockholders of this road met last week and re-elected the old board of directors and officers, as follows: President, Gen. E. F. Alexander, Savannah; General Superintendent, V. E. McBea, Savannah; Treasurer, J. H. Hall, Atlanta; Secretary, E. Workman, Atlanta; Directors: J. Pollak, C. A. Stern, J. R. Warren, Montgomery; J. W. Tullis, G. L. Comer, S. H. Dent, Eufaula, Ala.; William Stake'ey, Union Springs, Ga.; E. P. Alexander and V. E. McBea, Savannah.

Newport News & Mississippi Valley.—A. T. Sabin has been appointed Chief Engineer in charge of the bridges, buildings and real estate of the Western division, with headquarters at Louisville, Ky. L. A. Washington has been appointed General Roadmaster in charge of the track, headquarters at Paducah, Ky. The office of Superintendent of Road Department has been abolished.

Queensboro, Falls of Rough & Green River.—The new owners of the railroad have organized the company with M. V. Monarch, of St. Louis, President; M. B. Mann, of Belleville, Ind., Vice-President and General Manager, and S. M. Deane, Secretary.

Restigouche & Victoria.—The following have been appointed directors: John McAlister, M. P., President; Angus Sinclair, Levis Theriault, M. P., Robert Connors, Hon. Charles LaBillios; Hon. J. C. Barberie, Solicitor; William Murray, M. P., Secretary.

St. Paul & Duuth.—George H. Smith, Jr., Superintendent of Telegraph and Chief Train Dispatcher, having resigned to accept service with another company, E. L. Brown has been appointed to succeed him.

Scottsboro & Guntersville.—The company has been re-organized with W. E. Baskette, of Chattanooga, Tenn., as President, and Samuel P. Dodson, Secretary.

South Atlantic & Ohio.—D. H. Conklin, General Superintendent, has been appointed General Manager of the road, with headquarters at Bristol, Tenn.

Valley (Virginia).—At the annual meeting at Staunton, Va., Nov. 16, Charles F. Mayer was re-elected President and W. H. Hams Secretary. The following board of directors was elected: W. H. Hams, Charles F. Mayer, H. Crawford Black, Henry Duvall and Osmun Latrobe, Baltimore; R. W. Burke, Staunton, Va.; J. J. Allen, Waskey's Mills, Va.; W. A. Anderson, Lexington, Va.

Wabash.—Christopher Geiger will be succeeded as general foreman of the shops at Delvey by A. E. Thatcher.

West Florida & Georgia.—E. S. Lawrence, Chief Engineer of the Zanesville Terminal, has been appointed Chief Engineer of the road.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Alloway & Quinton.—The branch of the Salem Railroad, which leaves the main line a short distance above Alloway Station, N. J., and extends through the village of Alloway, about two miles distant, and on to Quinton, three miles further, is nearly completed. The grading of the road was finished last week and the tracklaying

has been rapidly pushed forward, and the rails will be laid to Quinton in a few days.

Atlantic Coast Line.—Thirteen miles of the track of the short cut railroad between Fayetteville and Rowland, N. C., have been laid—five miles at the Rowland end and eight miles at the Fayetteville end. The track has been laid from Fayetteville to Big Rock Fish Creek, a distance of eight miles, and there suspended pending the building of the bridge over that stream, which will be completed this week. It is contemplated to have the entire track laid from Fayetteville to Rowland, by Jan. 1.

Bay of Quinte.—A project is on foot to extend this line from Harrowsmith to Svidenham, Ont., and later to connect with the Thousand Island Railroad.

Beech Creek.—The extension now being built by this company is only a few miles long, to La Jose, Pa., on the Pennsylvania & Northwestern. The purpose is to connect some undeveloped coal fields along the new line. Ultimately this extension is to be continued into Cambria County, to Carrolltown, or near there, to strike more coal fields. One of the directors denies the stories that the Beech Creek is to be made a part of a through line by connecting it with the Franklin branch of the Lake Shore road that extends from Oil City to Ashtabula.

Burlington & Missouri River.—Regarding the extension from Culbertson, Neb., to Holyoke, Colo., Vice-President Harris says that the rails were laid to Beverly, Neb., last year, and that the grading was completed in 1887. All that is being done now is putting down the iron over 23½ miles of this graded roadbed through Beverly, Palisade, Howlet and Wauseta. The new country thus penetrated has a large grain crop.

Central Counties.—The rails of this road have been laid in to Hawkesbury Village, completing 21 miles from Glen Robertson, the junction with the Canada Atlantic. Ballasting is about finished to Vanleek Hill, 14 miles northeast, and passenger trains will be put on that portion of the road this month.

Chesapeake & Ohio.—The company has decided upon building a section of double track between Alderson and Lowell, W. Va., a distance of about 10 miles, as stated last week, and it is considering seriously the matter of building a second track from the end of the existing double track at Low Moor, Va., to Covington, Va., a distance of about eight miles, but this has not yet been definitely decided upon, as the work is very expensive. J. C. Carpenter, who had the contract for the work between Alderson and Lowell has sublet the contract to Boxley & Haley.

Denver & El Paso.—The surveyors of the Trinidad and El Paso short line began work at Trinidad, Colo., Nov. 13, in the western part of the city, working up the river. The line will follow the Las Animas River to Stonewall, when it will turn south, following the base of the main range of mountains to the south. P. H. McCricket is in charge of the survey between Trinidad and Las Vegas, N. Mex.

Florida, Georgia & Western.—There was filed in the County Court at Tallahassee, Fla., Nov. 5, a mortgage given by the railroad formerly known as the Gainesville, Tallahassee & Western, to the Central Trust Co., of New York, for the sum of \$6,000,000.

Great Northern.—The tracklaying on the Pacific extension is to be continued for some time yet, and will not only be put down westward from the terminus, but also from several points where the road has been graded. A connection with the Northern Pacific has been made at Sand Point, Idaho, and the track will be laid east and west of that point. The contracts to Albany Falls were let in the spring to be completed Jan. 1. The work from the Montana line to Bonner's Ferry, Idaho, is nearly completed. Some bad slides are anticipated along the Kootenai River, which will require considerable labor to clear away. Burns & Chapman's work from Bonner's Ferry to the Half Way house is not so well along as the balance to Chatteroy. Unless some extra exertions are made it will drag on well to ward spring, but an extra force will be put to work on it. P. Welch & Co., whose contract extends from the Half Way house to Sand Point, expect to have the work ready for the rails in six weeks. Below Sand Point the work is very nearly complete to Albany Falls.

Gulf & Chicago.—J. P. Keating & Co., of Pittsburgh, have been awarded a contract, according to the press dispatches, for building over 225 miles of this road between Cedar Point, Ala., a town on the Louisville & Nashville below Mobile, to Tuscaloosa. It is said to have been arranged to begin the construction work this month at Whistler, on the Mobile & Ohio road, a few miles out from Mobile. The survey of the line has been made from Tuscaloosa through Greensborough, Fauns dale and to Bigbee River, and through Bladen Springs to Cedar Point and Mobile.

Houston, Central Arkansas & Northern.—Chief Engineer Rust reports the work on the two bridges over the Red and Ouachita rivers and the tracklaying as progressing finely. Over 20 miles of the track has been laid from Columbia south toward Alexandria, and he can safely say that they will lay from now out 2½ miles daily. It will not take many days to cover the small distance to be finished.

International & Great Northern.—A local report states that it has been arranged to resume work in a short time between Lockhart and Smithville, Tex., on the main line, to complete the branch of this road already partly built. The line was projected several years ago and the grade built for a number of miles, but the work was abandoned after a few miles of track had been laid.

La Salle & Bureau County Belt.—The arrangements for completing this road west of La Salle, Ill., are now about completed, and at an interview last week between representatives of the Chicago & Northwestern and the Chicago, Burlington & Quincy, an agreement was made for the junction of the new line with those roads and the Illinois Central, and the plans for the connection approved. The new road will be about 10 miles long, making a belt line at La Salle and extending through Bureau County to the western county line. E. C. Hegler is President, and Isham Randolph, of Chicago, is Chief Engineer.

Louisville, St. Louis & Texas.—This company will, it is stated, build a three-mile branch road to coal fields near Skillman, Ky.

Lower Laurentian.—Trains are now running on this road from Riviere a Pierre Junction on the Quebec & Lake St. John southwest to St. Tite Junction, Que., the northern terminus of the Piles branch of the Canadian

Pacific. This section of road is 30 miles long, and extends through a populous agricultural district for part of the distance and through a heavily timbered district. The road has been carefully built, and the rails laid weigh 56 lbs.

Marquette & Western.—This company, whose incorporation in Wisconsin was noted last week, was organized by the Business Men's Association, of Marinette, as a result of a meeting between officers of the Wisconsin Central Railroad, citizens of Antigo and representatives of the local Business Men's Association. The incorporators are Hon. Isaac Stephenson, A. C. Merriman, F. Carney, of Marinette, and Jesse Spalding, of Chicago. The company proposes to build a new road from Abbottsford, a junction of the Wisconsin Central and Abbottsford & Northeastern roads, east a distance of about 150 miles to Marinette. This new road will cross the Milwaukee, Lake Shore & Western at Antigo, and open up a rich timber country, and will be a valuable outlet for the western wheat fields and also the mines of the Gogebic range on the Menominee River.

Minneapolis, St. Paul & Sault Ste. Marie.—The company ran the first through train from Minneapolis to Valley City, N. D., last Monday. The branch extending from Hankinson to Valley City, which was only recently completed, is 81 miles long. Hereafter there will be two through trains a day, one each way, between Minneapolis and Valley City. The line from Hankinson west to Oakes will now be designated as the branch and the Valley City division a continuation of the main line.

Missouri Pacific.—Probably the use by this company of its new cutoff between Plattsmouth and Portal, near South Omaha, will be delayed until another bridge can be constructed across the Platte River at Plattsmouth. The tracks are laid on the bridge of the Burlington & Missouri River road at that point, and it was the intention to use that bridge, but its officers have refused the use of the bridge, as the arrangement was contingent upon the use of the tracks of the Union Pacific from Gilmore to South Omaha by the Burlington & Missouri River road. Messrs. Clark & Holdrege held a conference on this subject last week, but no conclusion was reached. Mr. Clark stated that he was of the opinion that the Missouri Pacific would build a bridge of its own at Plattsmouth. It was the ultimate intention of the Missouri Pacific to run its passenger trains into the proposed union station, using the tracks of the Union Pacific from Gilmore, thus leaving the Belt line for the use of freight trains, but for the present passenger trains would continue to use the Belt line and Webster street station.

Morristown & Cumberland Gap.—Tracklaying was resumed last week after a suspension of about six weeks, caused principally by the failure to deliver the rails. About 400 men are being employed in laying the track, and the officers expect to have the road completed by Dec. 1 between Morristown and Corrytown, Tenn., where a connection is made with the Knoxville, Cumberland Gap & Louisville.

Nashville & Cumberland Gap.—The grading on the extension of the Nashville, Chattanooga & St. Louis is being pushed steadily, the weather being favorable for the work. About seven miles of the road is ready for the cross-ties and about four miles is already completed. The force is composed of about 150 hands, but will be gradually increased. The road for the present will form a junction with the Nashville & Knoxville at Cookeville. James O'Connor is General Manager.

Navesink.—Grading has been commenced on this branch of the Central of New Jersey, to extend from Atlantic Highlands to Highland Beach, N. J., a distance of about four miles. The contractors are Burke & Co., of Scranton, Pa. The contract for all the bridge and trestle work has been awarded to Cofrode & Saylor, of Jersey City.

New Roads.—The La Pierre Phosphate Co. will, it is said, build a standard gauge road from its mines to Tallahassee, Fla., to connect with the tracks of the Florida Central & Peninsular, Florida & Western, the Carabelle, Tallahassee & Georgia, and other roads. It will be between three and four miles in length.

The new lumber railroad from Gilead station, Me., up Wild River is completed, and trains run up as far as Nigger Tom opening, a distance of four miles.

Paul Didier, Chief Engineer of the Pittsburgh & Western, with several assistants, is surveying a line from Southport north toward Wilmington, N. C.

Engineers began a survey Nov. 6 for a line for the Murphy Lumber Co.'s new logging railroad extension from towns Thirty-seven and Sixteen, near Armstrong Creek, on the "Soo" road near Green Bay, Wis., through towns Thirty-six and Sixteen, where the road will terminate at the main Peshtigo River, a distance of 22 miles.

The red hematite ore beds, near Christiansburg, Pa., have been sold to a syndicate composed of Virginia and Northern capitalists, and a railroad will probably be immediately built to the mines, which are now being opened.

Beckwith & Rogers, of Sparks, Ga., intend building a short railroad from Sparks to Bayboro, Ga.

The Montague Coal Mining Co., of Fort Worth, Tex., proposes building three miles of new railroad.

New Westminster Southern.—This road is practically completed and regular trains could be run at once if it were not that there still remains some surfacing to do between Fairhaven and Seattle. This should have been completed before, but some unforeseen delays interfered. However, everything was to be in readiness by Nov. 15 to begin the train service between Seattle and Westminster.

New York, Lake Erie & Western.—An application was made to the State Supreme Court at Jersey City last week for the appointment of commissioners to condemn a right of way for a short freight connection between this company and the West Shore road. The new road is to extend from a point on the main line of the Erie near Twelfth street, Jersey City, to the Elysian Fields, Hoboken.

Nippissing & James Bay.—This company will apply at the next session of Parliament for an act to extend the time limit for the commencement and completion of the road, for the alteration of the point of commencement and the power to increase the issue of bonds to a sum not exceeding \$25,000 per mile.

Norfolk & Western.—E. S. Moorman & Co., of Lynchburg, Va., who have the contract for building 20 miles of the Elkhorn extension through West Virginia, beginning at a point 30 miles from Elkhorn, have been notified to proceed at once with work on that contract, which had been temporarily suspended. Thompson Bros., of Knox

ville, Tenn., have been awarded the contract for 30 miles of this extension, including the completion of a tunnel and bridge work.

Northern Pacific.—The second track near Tacoma, which was begun nearly a year ago is now completed to Puyallup, nine miles east of Tacoma, which is as far as it is proposed to build it. It is now in operation, greatly relieving the movement of trains at Tacoma. The men who have been working on this line have been transferred to the Ocosta line, which is being built by the same contractors, Griggs & Huestis of Tacoma. This line is being ballasted west of the Chehalis River, and it will now soon be in operation its entire line to Aberdeen and Gray's Harbor. The road west of Montesano, the terminus of the operated line, has been ballasted west to the river for some time. The rain has greatly interfered with the progress of the work.

Odessa & Middletown.—The grading on this short road in the northern part of Delaware was begun last week near Odessa. The road as now to be built extends from Odessa to Middletown and is 4½ miles long. The charter of the company will be amended this winter and it is proposed to extend the line nine miles further through New Castle County. The route is through a level country and has been located, and the right of way secured. The road is to be completed early in January. W. R. Pope, of Odessa, is General Manager, and Henry R. Campbell, of 18 Broadway, New York City, is Chief Engineer.

Pennsylvania.—It is authoritatively announced that the Chestnut Hill branch of the Pennsylvania Railroad will be extended from near Norristown to connect with the new Trenton cut-off a short distance below Fort Washington, Whitemarsh township. The line has been nearly all located, and probably the active construction of the line will begin next month. Part of the right of way has already been purchased. The new extension leaves the present Chestnut Hill tracks at Cresheim Creek and runs northeast in the direction of Camp Hill. There has as yet been no move made toward extending the line beyond the cut-off, except that the company has given orders to make a survey as far as Ambler and beyond between the tracks of the North Pennsylvania and Northeast Pennsylvania.

The Trenton branch is rapidly nearing completion and very little work now remains to be done before the road will formally be opened for traffic. The construction gangs are now working on the connections at Glen Lock, near Norristown, and at the present rate of progress the work should be completed before Dec. 1. It is expected that the line will be in operation in the early part of next month. The new line will enable the Pennsylvania to carry freight much more expeditiously than at present, as the company will thus be enabled to ship freight direct between the West and New York without the delay of shifting cars at the yards in West Philadelphia.

Perry County.—The 12-mile extension of this road, from Landisburg to New Bloomfield, has been completed to within a mile of Lousville, Pa., where connection will be made with the Newport & Sherman's Valley road.

Phoenix, Santa Fe & Prescott.—About seven miles of track north of Phoenix, Ariz., is reported to have been already laid, although the contractors only began work last month. The road is being built between Phoenix and Prescott, Ariz., and will be about 140 miles long.

Pioche & Jackrabbit.—The rails necessary to complete the last end of the road have left Milford, Utah. The tracklaying is being vigorously pushed, and is now within half a mile of the Onondago.

Port Reading.—Work is being pushed on this extension and the first 10 miles east of Bound Brook, N. J., is practically finished so far as the grading, mason-work and bridging are concerned and is ready for the crossties and rails. The terminal work at Port Reading is rapidly progressing toward completion, a large force of men being employed night and day in the construction. Work on the intermediate portion of the road has been delayed somewhat through difficulty in obtaining right of way, but matters of that nature having been all satisfactorily settled the work is being prosecuted with vigor and dispatch.

Pueblo & Duluth.—The locating surveys through Nebraska from Sioux City southwest about 300 miles to Culbertson in the southwestern part of the state near the Kansas state line have been recently completed. The annual meeting will be held at Neligh, Neb., in a few weeks, and before that time President Hitchcock expects to have the estimates and profiles of the engineers completed and to have made arrangements for beginning a small part of the work this year. The present plans contemplate the award of the contract this winter for building the greater part of the line through Nebraska and in the spring the construction of the line will begin at Neligh, on the Fremont, Elkhorn & Missouri Valley road, in the northern part of the state.

Pueblo, Wet Mountain Valley & Easton.—A committee of business men of Pueblo, Colo., has recently revived this project and has arranged to have a new survey made between Pueblo and Silver Creek, Col. A preliminary survey was made about two years ago and the line as projected will be about 75 miles long, and will extend west to Bueland and around the foot of the mountain past Red Creek Springs to the summit of the range and to the Silver Cliff mines. Estimates are to be made for the committee by A. M. Welles, the Chief Engineer.

Rio Grande Western.—Col. Dodge, the general manager of the road, says that the rumor that the company would immediately extend its line from Ogden to San Francisco was purely imaginary. "We may in the course of time go further west, but not soon. If the people of Salt Lake City want to build a line to the coast, and have the money to pay for it, it will be built. It is true that the business men of San Francisco have been interviewing us with the purpose of securing our co-operation, and terminals have been offered us. But we have only one answer, and that is, if the local business warrants the extension of our Tintic branch, we will make it, even if it extends to San Francisco."

Roanoke & Southern.—There is only about 17 miles of track to be laid on the 60 miles between Roanoke and Martinsville, Va., to connect the track, and two forces are working on the section, one from the Roanoke end and from the Martinsville end. The company expects to complete the work about Dec. 15, and probably it will be 30 days later before the line through to Roanoke will be open for traffic.

Sandusky, Columbus, Lake Erie & Southern.—The tracklaying south of Sandusky, O., was completed last week to Bellevue, at the junction of the Lake Shore &

Michigan Southern and New York, Chicago & St. Louis roads. The town is about 15 miles from Sandusky, and this is about as far as the grade has been completed. Some little work is now being done south of Bellevue.

Savannah, Americus & Montgomery.—A temporary track has been laid from Clisby's Park, near the track of the Montgomery & Eufaula, outside the town limits of Montgomery, to a point in the city, within a few blocks of the temporary station. The Montgomery extension is now completed between the Chattahoochee River and the city with the exception of a gap of three miles on which the track is now being laid. It is expected that the work will be completed by Dec. 1, and that trains will be running on the line soon after that date.

Shuswap & Okanagan.—The rainy season has commenced, but workmen are kept busy grading the last section of the road to the terminus on Okanagan Lake, B. C. It will be opened early in January, probably for its entire length. It is 51 miles long and extends from Sicamous to Okanagan Lake.

Silver Springs, Ocala & Gulf.—The track on the extension to Brooksville, Fla., was laid into the town of Inverness near that point last week. Recently the work has progressed very rapidly, the grading and tracklaying going on night and day for some time. Near Inverness the extension crosses an old grade of the South Florida road three times within one mile. The grade of the new road is built on a lower level than that of the South Florida and where the latter line is crossed its grade has been leveled several feet. The company secured an injunction stopping the work on the new line, but the rails were nevertheless laid and a passenger train run into Inverness.

Southern Pacific.—The construction work on these lines is exceedingly dull at present, and the year of 1891 will be the dullist in this regard of any in the history of the company. Reconstruction is going on slowly at several points, where it is necessary, and considerable repairing has been done to put the road in a safer condition for winter travel. Grading has just been commenced on the line from Nahant to Redlands and Crofton, Cal., a distance of eight miles, and the road will be ready for operation about the middle of December. Two miles of wharf track are being put in near Santa Monica, and the reconstruction of the line near Yuma, Ariz., has been commenced. Quite a large force of men is employed at this point. Grant Brothers have the contract, which calls for completion on Jan. 1.

Tamaqua, Hazleton & Northern.—Work is rapidly progressing on the new line being constructed by the Philadelphia & Reading railroad to connect its system at a point near Hazleton, Pa., with the Delaware, Susquehanna & Schuylkill Railroad, which latter is being constructed and is owned by the Cox Brothers. The tracklaying has been commenced and it is expected that the entire line will be ready for traffic in a month's time. The opening of these two roads will add very largely to the business of the Reading Railroad Company, as the large tonnage of the Cox Bros. & Co.'s collieries will pass over its lines to tidewater, and it will also secure the additional traffic resulting from the transportation of supplies, general merchandise and passengers to and from the various points in that territory. The construction of the line is first class in every particular. The contractors are A. J. McBean, of Chicago, and William Nolan, of Reading, Pa.

Tennessee River, Ashville & Coosa.—Col. A. Johnson told several citizens of Ashville, Ala., who subscribed to the bonus for the road raised in that town, that during a recent visit to New York he arranged for the money to complete the first section of the road. By March 1 next, said Col. Johnson, the rails will extend from a point in Murfree's Valley, near Ashville, to the Coosa River. Not later than Dec. 15 from 1,600 to 2,000 hands will be working on the roadbed. President James, of the Chattanooga Southern, says that his road will be extended to connect at Ashville, provided a clear right of way can be secured from the Etowah County line.

Texas, Louisiana & Eastern.—The rails for the first section of the road have been delivered at Conroe, Tex., and contractors began the tracklaying last week. The grading has been completed for 14 miles east of Conroe, but at present only about 85 teams are employed on this work. The ties have been put down for about five miles, and are being laid on the balance of the graded road. The charter of the company is for a road to extend through Montgomery and Liberty counties and across the Trinity River, a distance of 50 miles, passing through an excellent timber country. C. M. Putnam is President of the company.

Texas Trunk.—A movement had been started at Palestine, Tex., to organize a construction company to build a railroad from Palestine to the terminus of the Texas Trunk, northwest of Athens. W. H. Gaston, Daniel Gregory and J. N. Simpson, of Dallas; G. W. Burkitt and G. A. Wright, of Palestine, and T. F. Murchison, of Athens, will charter the company. As the Trunk road affairs are in such a condition at present as to prevent its extension, the new road will be built to connect with the Trunk road so as to give a continuous line from Palestine to Dallas. The extension of this line to Palestine will earn a subsidy of \$30,000, voted by Palestine.

West Virginia Central & Pittsburgh.—A special train, carrying President Davis and an inspection party, was run over the new branch to Beverly, the county seat of Randolph County, seven miles south of Elkins, W. Va., on Nov. 11, being the first train to pass over the new line. One mile south of Elkins the construction of a railroad northward has been begun which will extend to Bealington, in Barbour County, a distance of 18 miles. At Bealington the narrow-gauge road is met, Grafton & Greenbrier, which runs to Grafton, a distance of 42 miles, and is owned by the Baltimore & Ohio road. This is to be made a standard gauge road as speedily as possible. From there the Baltimore & Ohio has a road to Morgantown, Monongahela County, and has partly graded a line north to Uniontown, Pa., which is the terminus of a branch connecting at Connellsville with its line to Pittsburgh. When the gaps are built a new line will be opened between Pittsburgh and the coal mines of West Virginia.

GENERAL RAILROAD NEWS.

Atlantic & Pacific.—An agreement has been reached with the St. Louis & San Francisco management whereby the latter road has taken up the Atlantic & Pacific second mortgage bonds guaranteed by that company, giving in exchange its own four per cent. bond. The Atlantic & Pacific second mortgage bonds were originally guaranteed, one-half by the Atchison and one-half

by the St. Louis & San Francisco. The Atchison took up its half at the time of the reorganization, but the rest have remained outstanding until now.

Baltimore & Ohio.—The following statement of the earnings of the system for October includes lines both east and west of the Ohio River:

	1891.	1890.	Inc.
Gross earnings.....	\$2,289,977	\$2,233,217	\$56,760
Operating expenses.....	1,541,587	1,496,499	55,088
Net earnings.....	\$748,390	\$736,718	\$11,672

The annual report for the year ended Sept. 30, 1891, shows that the total gross earnings and income for the fiscal year were \$25,790,272; operating expenses, \$17,268,909, and net earnings, \$8,521,272. After paying interest on rentals, taxes, dividends on the first and second preferred stock, and car trusts, sinking funds, etc., a balance remains of \$1,320,616. The revenues of the first half of the fiscal year were materially affected by the failure of the crops of 1890, and the revenues of the Pittsburgh & Connellsville system and of the Pittsburgh & Wheeling Division were largely reduced owing to the entire suspension of the coke traffic upon these divisions during a strike of 15 weeks. A comparison of 1891 with 1890 shows an increase in gross earnings of \$118,290, or .48 per cent.; operating expenses, \$111,363, or .06 per cent.; net earnings, \$6,935, or .9 per cent.; decrease in freight earnings, \$178,626, or 1.05 per cent.; increase in passenger earnings, \$390,290, or 6.42 per cent.; increase in tons moved, 782,493, or 5.59 per cent.; increase in passengers carried, 139,450, or 1.42 per cent.

The gross earnings of the Philadelphia line, embracing the Baltimore & Philadelphia Railroad and the Philadelphia branch, were \$1,899,639, against \$1,606,840 in 1890; expenses, \$1,343,180; net earnings, \$556,457, against \$450,234 last year. The net earnings of the main stem division were \$4,613,672; of the Pittsburgh division, \$681,795, and of the Washington branch, \$190,766.

Commencing Dec. 1, the company removes its trains from the Illinois Central tracks to the Grand Central Station in Chicago and will use the new Northern Pacific terminals.

Boston & Maine.—About \$400,000 dividend money of the company was deposited in the Maverick National Bank, of Boston, when it suspended a few weeks ago. The directors, however, state that any loss that may occur will not delay the payment of the regular dividend or seriously affect the company. Nevertheless, the circulation of rumors, regarding the finances has been kept up. General Manager Furber met these statements in an interview this week. He said: "When the Central Massachusetts and the St. Johnsbury & Lake Champlain and the Boston & Lowell roads pay the debts due the Boston & Maine for improvements made on those roads the much talked-of floating debt will disappear. The committee to consider the advisability of certain consolidations authorized by various legislatures has not yet reported to the directors. Another committee is considering the names of new directors to be presented to the stockholders at the annual election."

Buffalo, Rochester & Pittsburgh.—The annual report shows the gross earnings for the year to have been \$2,542,153.22, an increase of 28.42% over the previous year; operating expenses, \$1,790,323.38, an increase of 37.20%; and net earnings, \$751,831.84, an increase of 11.29%. The surplus, after all charges, is \$74,500. The bonded indebtedness has been increased by \$225,000 new car trusts, part of which issue was used to retire \$101,000 of an old issue. Other bonds were paid off, making the total increase in the bonded debt \$93,500.

Carleton Branch.—The corporation of the city of St. Johns, N. B., have been informed that they will have to secure legislation for power to issue bonds for \$40,000 to pay the Dominion Government for the Carleton branch, the Canadian Pacific having asked for an execution of the lease.

Central Massachusetts.—The directors will ask the next state legislature in Massachusetts to authorize an issue of new bonds, but the exact amount to be put out cannot yet be told. Their proceeds will be used to pay for future improvements as the business of the company may require, but not, President Aldrich says, for any improvements made on the Boston & Maine in the past. There is no immediate intention of double tracking the road, but a considerable amount of new siding may be put down. The old issue of \$2,000,000 five per cent. are in the treasury of the Boston & Lowell road, which issued \$2,000,000 of its own four per cent. bonds against them. General Manager Furber spoke on the matter as follows: The new issue of Central Massachusetts bonds is for money to reimburse the Boston & Maine for expenditures incurred for additional rolling stock and increased sidings. Probably \$2,000,000 additional bonds will be sufficient to put the road in proper shape to handle the present business.

Central Vermont.—The lease of the New London Northern to the Central Vermont, made in 1871, expires next month, and the directors of the two companies are now considering a new lease. A meeting of the Consolidated Railroad of Vermont is called for Dec. 9 to vote not only upon this lease, but upon a consolidation of the Central Vermont the Consolidated Railroad Co. of Vermont, the Vermont & Canada and the Montpelier & White River, as agreed to by the directors. The latter roads are lines controlled by the Consolidated of Vermont and leased by the Central Vermont. The proposed new lease of the New London Northern road provides for the payment, by the Central Vermont, of all taxes and a rental of \$210,000 per annum, in monthly installments of \$17,500. The New London Northern may renew or change its bonds, the limit not to exceed \$1,500,000. The lease may be terminated on 30 days' notice.

Cincinnati, Jackson & Mackinaw.—The application in the United States Circuit Court, at Cleveland, O., on Nov. 13, to have the sale of the two divisions of the road confirmed, was granted, and the purchasers of the so-called central division will have until Dec. 1 to pay \$100,000 in cash and 30 days thereafter to complete the payment. Should this first payment of \$100,000 not be made, the order directs that the road shall be resold on 10 days' advertising without further instruction from the court. These payments must be made in cash. If the division is sold again it will be purchased by the Reorganization Committee, who bought the northern division at the foreclosure sale, but were outbid by dissenting bondholders on the middle and more valuable division.

Columbus, Hocking Valley & Toledo.—The stockholders of the company, at a special meeting held in Columbus, O., Nov. 12, voted to favor the issue of \$2,500,000 of preferred stock to take up \$777,000 seven per cent. bonds due on Jan. 1, 1892, and to provide for \$213,000 of maturing car trusts heretofore met out of surplus earnings.

Dansville & Mount Morris.—B. P. Humphrey, Superintendent of the road, says that the road will be open for business this week. The company has bought two locomotives, and passenger and freight cars, and proposes to operate the road independently. Trains have not been running for several weeks, the New York, Lake Erie & Western having withdrawn its service. The name of the road, then the Erie & Genesee Valley, has been changed.

Delaware, Lackawanna & Western.—The company reports the operation of its system for the quarter ending Sept. 30 as follows:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$2,146,550	\$2,328,857	D. \$182,307
Operating expenses.....	1,077,772	1,031,708	I. 46,064
Net earnings.....	\$1,068,778	\$1,297,149	D. \$228,371
Fixed charges.....	389,582	578,749	I. 189,167
Surplus.....	\$479,196	\$718,400	D. \$239,202

The surplus of the Syracuse, Binghamton & New York road, after paying all charges, was \$75,255, a decrease of \$24,072 as compared with the corresponding quarter of last year.

Detroit, Lansing & Northern.—McPae & Lally, of Grand Rapids, Mich., who built the Grand Rapids, Lansing & Detroit road, from Grand Ledge to Grand Rapids, and who obtained judgment from the road last spring for \$91,531 for non-fulfillment of contract, have applied to have a receiver appointed. The road is leased and operated by the above company.

Kansas & Colorado Pacific.—A special meeting of the stockholders last week authorized an increase of the capital stock of the company from \$20,000,000 to \$27,000,000, and also authorized the directors to complete the purchase of the Fort Scott, Wichita & Western and lease of the Colorado Pacific road, a road extending from Wichita, Kan., to Pueblo, Colo.

Lebanon Springs.—The county judge at Saratoga, Rensselaer County, N. Y., has made an order authorizing William V. Reynolds, receiver of the road, to issue bonds to the amount of \$200,000 to repair the damage to the road caused by the flood of Aug. 27 last. The road is 28 miles in length, running from Chatham to Bennington, Vt. The flood of Aug. 1 destroyed 11 miles of track, and only two weeks ago temporary repairs were completed which allowed passage over the entire road.

Manhattan (Elevated).—The company reports the following earnings and expenses for the quarter ending Sept. 30:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$2,396,129	\$2,194,403	I. \$201,726
Oper. expen.....	1,286,780	1,135,144	I. 151,636
Net earnings.....	\$1,109,349	\$1,059,259	I. \$50,090
Other income.....	35,000	21,500	I. 13,500
Total income.....	\$1,144,349	\$1,080,759	I. \$63,590
Fixed charges.....	600,193	590,843	I. 9,350
Surplus.....	\$544,156	\$489,916	I. \$54,240
Dividend, 1½ per cent..	450,000	390,000	I. 60,000
Surplus.....	\$94,156	\$99,916	D. \$5,760
Cash on hand.....	170,485	3,832,821	D. 3,662,336

Marietta & North Georgia.—In the United States Court at Atlanta, Nov. 14, the application of Receiver Glover for authority to issue about \$2,000,000 receiver's certificates to raise money for the purpose of putting the road in good condition was heard. The original application was referred to a special master in chancery, who reported favorably on the issue of \$1,000,000 receiver's certificates. It is thought that the certificates will be ordered issued.

Montreal & Sorel.—This company has presented a petition to Judge Gill at Montreal asking that the road be again placed in the hands of the former lessee, the Great Eastern railroad, so that the line may be operated during the winter months.

Morgans' Louisiana & Texas.—The Morgans' Louisiana & Texas Railroad and Steamship Co., at a meeting of stockholders at New Orleans, Nov. 17, voted to increase the capital stock of the company from \$5,000,000 to \$15,000,000. In explanation it is said that when the company was first organized it was not capitalized at its full value. New stock will be issued, but one of the officers states that none of the stock will be on the market.

Newport News & Mississippi Valley Co.—Mr. C. P. Huntington, who controls a large majority of the stock of the company, said, just after his return to New York, after an inspection of the eastern division, the Elizabethton, Lexington & Big Sandy, that the reports that he would soon sell the road were not true. There are no negotiations in hand for such a transfer. I think the change will be made in time, however. The Newport News road really belongs to the Chesapeake & Ohio system, as laid out by me. It is for sale, as has been known for a long time. I shall sell all my railroad property east of the Mississippi, keeping only the shipyards at Newport News.

New York, Chicago & St. Louis.—The company publishes the following report of earnings for the three months ending Sept. 30:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$1,509,214	\$1,425,388	I. \$83,826
Operating expenses.....	1,243,340	1,077,272	I. 166,068
Net earnings.....	\$265,874	\$348,116	D. \$82,242
Other income.....	1,281	1,748	D. 467
Total income.....	\$267,155	\$349,864	D. \$82,709
Fixed charges.....	251,125	251,112	I. 13
Surplus.....	\$16,030	\$98,752	D. \$82,722
Cash on hand.....	552,030	778,150	D. 226,120

New York & Northern.—The annual report covers the results from Oct. 1, 1890, to June 30, 1891, showing gross receipts of \$349,938 and operating expenses of \$291,934. The increase in passenger earnings from the corresponding nine months of the previous year is \$24,090, due to the growth of the local traffic. The freight earnings fell off \$79,558, due to the loss of traffic formerly interchanged with the New York & New England via Brewsters.

Northern Adirondack.—The New York State Railroad Commissioners have approved the increase of the capital stock of the company from \$450,000 to \$840,000, with the understanding that the road will cancel a mortgage of \$825,000, pledged as security for the repayment of \$150,000 indebtedness incurred for the rental of rolling stock. Of the increase of stock the sum of \$125,000 will be devoted to the purchase of new equipment, \$150,000 to the payment of the indebtedness in-

curved for the rental of rolling stock, and the remainder toward a reduction of the balance of debt incurred for the original construction and extension of the road, amounting to \$550,000.

Rome, Watertown & Ogdensburg.—Drexel, Morgan & Co., of New York, have purchased from the New York Central & Hudson River Railroad the consolidated mortgage extended five per cent. bonds of this company, due in 1922, and issued to take up the seven per cent. bonds of the last-named company maturing on Dec. 1. They offer to the holders of the maturing bonds an opportunity to exchange them for the five per cent. bonds on the basis of par and accrued interest to maturity for the old bonds and 108½ and accrued interest for the five per cent. bonds. Both the principal and interest are guaranteed by the New York Central Railroad.

St. John & Maine.—The general meeting of the company was held in London Nov. 11. The provisional agreement for the absorption of the line by the Canadian Pacific system was explained. Each shareholder would receive £40 of New Brunswick Railroad four per cent. debenture stock, guaranteed by the Canadian Pacific, thus getting £1 12s. as dividend, whereas there is £1 only now received. The board strongly urged the acceptance of the offer, and the shareholders are likely to assent to the plan.

Union Pacific.—The statement of earnings of this system for September was only published this week. It is as follows:

UNION PACIFIC SYSTEM.			
	1891.	1890.	Inc. or dec.
Month of September:			
Gross earnings.....	\$1,319,050	\$4,653,946	I. \$3,334,896
Oper. expenses.....	2,335,565	2,400,002	D. 64,437
Surplus.....	\$1,983,485	\$1,563,944	I. \$419,541
Since Jan. 1:			
Gross earnings.....	\$31,165,398	\$32,703,585	D. \$1,538,187
Oper. expenses.....	20,827,387	21,992,564	D. 1,165,177
Surplus.....	\$10,338,011	\$10,711,021	D. \$373,010

Union Pacific System Proper.			
	1891.	1890.	Inc. or dec.
Month of September:			
Gross earnings.....	\$4,192,339	\$3,910,064	I. \$282,275
Oper. expenses.....	2,253,749	2,300,314	D. 46,565
Surplus.....	\$1,938,590	\$1,549,750	I. \$388,840
Since Jan. 1:			
Gross earnings.....	\$30,309,409	\$31,553,010	D. \$1,243,601
Oper. expenses.....	20,083,375	21,016,391	D. 932,986
Surplus.....	\$10,226,034	\$10,536,619	D. \$310,585

Oregon Short Line & Utah Northern.			
	1891.	1890.	Inc. or dec.
Month of September:			
Gross earnings.....	\$637,736	\$623,234	I. \$14,502
Oper. expenses.....	365,926	451,201	D. 85,275
Surplus.....	\$271,810	\$169,033	I. \$102,777
Since Jan. 1:			
Gross earnings.....	\$5,621,502	\$5,508,594	I. \$112,908
Oper. expenses.....	3,461,841	3,620,401	D. 158,560
Surplus.....	\$2,159,661	\$1,888,193	I. \$271,468

Oregon Railway & Navigation.			
	1891.	1890.	Inc. or dec.
Month of September:			
Gross earnings.....	\$617,521	\$327,081	I. \$290,440
Oper. expenses.....	235,614	342,151	D. 106,537
Surplus.....	\$381,907	\$184,930	I. \$196,977
Since Jan. 1:			
Gross earnings.....	\$4,026,233	\$3,314,820	I. \$711,413
Oper. expenses.....	2,740,908	2,862,779	D. 121,571
Surplus.....	\$1,285,325	\$452,041	I. \$833,284

Western New York & Pennsylvania.—The company is completing many improvements on the Rochester division this year. Two large iron bridges have been built over the Genesee River at Mount Morris and Cananda. The branch from Swains to Hornellsville has been relocated and rebuilt, and 40 miles of line has been ballasted. Nearly 55,000 oak ties have been put in place. The work of widening the narrow gauge between Kinzua and Marshburg will be finished this month. Eleven miles were changed last season. Within five miles on this division there are seven reverse curves, one of 28 degrees at a grade of 127 ft. to the mile.

TRAFFIC.

Chicago Traffic Matters.

Kansas City, St. Louis and Chicago passenger rates are again in an unsettled state, owing to the action of the Chicago & Alton in making a round-trip rate of \$10 between those points to meet action taken by the Western Passenger Association in making a reduced rate for the meeting of the National Alliance and Industrial Union at Indianapolis this week. Indianapolis being in territory from which the Alton has been shut out by the Board of Railroads, that road is unable to compete without reducing its local rates. The Chicago, St. Paul & Kansas City meets this by making the same rate from Leavenworth, St. Joseph, Des Moines, Dubuque and intermediate stations to Chicago.

The Alton also made a cut of \$4.30 from St. Louis to Chicago and return this week for a cattle show here, alleging that it was forced to do so by the action of the Jacksonville Southeastern in making an excursion rate in connection with the Santa Fe, notwithstanding the Western Passenger Association had voted not to use the rate within 30 miles of St. Louis.

The Freight Committee of the Central Traffic Association at their meeting last week decided that the present rule of that Association which prohibits the consigning of carload freight to agents of railroads in the territory of the Association for distribution among several receivers, in order to evade the less-than-carload rates, should be extended so as to prohibit the sending of instructions or requests (with way bill) to railroad agents to distribute carload lots among various parties. Agents at destination of freight so billed must refuse to make such deliveries except on correction of the billing to the full less-than-carload rates.

The full text of the decision of the arbitrators in the Aitchison appeal from the ruling of Chairman Finley that the bulleting of tickets was not a bar to their redemption has now been furnished. They hold that the framers of the agreement, being men of experience, were fully conversant with the practice of railroads in bulleting tickets for cause and that it is not the intent of the agreement to ignore the advantages long secured through this method of protection; hence their decision that bulleting is a bar to the subsequent redemption of tickets.

The Commissioners of the Western Traffic Association having given further consideration to the matter of the application of Mississippi River, Peoria and Chicago

rates to Missouri River traffic, have modified their former decision by excluding Dixon, Ill., from the Peoria group. The applications of the Iowa Central and Atchison, Topeka & Santa Fe for a change in the Mississippi River line to enable them to participate in business to and from Monmouth, Ill., are denied; in the case of the Iowa Central on the ground that that line reaches Monmouth over its own rails, and in the case of the Santa Fe on the ground that Monmouth is a main line point of the Burlington not reached by the Santa Fe over its own rails and the traffic as between Burlington and the Santa Fe is local to the former.

Lake grain rates are lower and dull at 4 cents for wheat and 3½ cents for corn to Buffalo. Lumber rates firm.

The Western lines have been asked to join with the Trunk lines in a proposition to meet the competition of the Canadian Pacific and Suez Canal routes by increasing the free baggage allowance on transcontinental tickets from 250 to 350 lbs.

A dispatch from Port Huron states that on account of low water the Central Vermont line steamers will not hereafter carry full cargoes east of Port Huron. An agreement has been made with the Grand Trunk by which the westbound boats will leave Ogdensburg several hundred tons light of full cargo and fill to capacity at Port Huron with rail freight. Eastbound they will discharge part of their cargo at that point for shipment by rail.

It is said that Chairman Walker has informed the Southwestern roads that they do not fairly report their statistics of traffic for his use in making apportionments under the "pool." It is claimed that some of them omit large quantities from their statements.

Traffic Notes.

The Rome, Watertown & Ogdensburg has given notice that it will not receive cars loaded to exceed 50,000 lbs.

The Chicago & Alton has made a through passenger rate of \$15 from Kansas City to Cincinnati over the Ohio & Mississippi.

The railroad commissioners of North Carolina have issued a tariff for packages carried by express, making reductions in some cases.

The receipts of grain over the Northern Pacific at Tacoma, Wash., during the month of October were 2,218 cars, an average of 67 a day.

The Vanderbilt lines announce that they will run excursions from New York and New England to San Francisco the coming winter, running solid trains through.

One of the results of the recent acquirement by the Baltimore & Ohio of control over the Ohio & Mississippi has been the formation by the Erie of a new line to St. Louis over the Vandavia road.

The "President of a leading western road" tells a New York reporter that the scarcity of freight cars west of Chicago is due in considerable measure to the fact that the railroads have neglected repairs so that there are now many crippled cars cumbering the tracks.

The Southern Pacific protests against the recent reduction of 36 per cent. in the rates on live stock ordered by the California railroad commissioners on a certain division of the road, and evidently intends to maintain existing rates.

The Missouri Pacific has notified shippers that it will receive no more grain for shipment to New Orleans at present. It appears that considerable grain has been sent there and that owing to the limited storage facilities the cars remain a long time before being unloaded.

The Union Pacific is being loudly complained of at Denver for not furnishing coal cars fast enough. Some manufacturers are short of coal, and claim that the Burlington distributes cars more fairly than the U. P. The latter is also accused of discriminating in favor of Southern Colorado points.

The Cleveland Board of Trade has sent to Secretary Blaine a protest against alleged discrimination against American shippers in the matter of tolls for freight sent through the Welland Canal. It is claimed that Canadian shippers receive certain rebates much more promptly than do those of this country.

Pittman & Harrison, grain dealers of Sherman, Tex., have made a statement that in the past two months they have shipped 156 cars of grain at rates fixed by the State Commissioners. On 106 cars there was an increase of 3½ cents per 100 lbs.; on 48 cars a decrease of 3.3 cents per 100 lbs. from former rates, and two cars at unchanged rates.

Representatives of the Kansas Millers' Association have been in New Orleans investigating the facilities for shipment of flour from that port. They say that they represent makers of 10 million barrels of flour annually, and that half this quantity is exported. They say that at present rates flour goes to Liverpool via New Orleans for 8 cents less per barrel than via the usual Atlantic ports. It appears, however, that the rates from New Orleans fluctuate widely, being very high when the cotton movement is active and very low at other times.

Eastbound Shipments.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Nov. 14 amounted to 67,199 tons, against 58,265 tons during the preceding week, an increase of 8,934 tons, and against 71,058 tons during the corresponding week of 1890, a decrease of 3,859 tons. The proportions carried by each road were:

	Wk. to Nov. 14		Wk. to Nov. 7.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	8,193	12.2	6,441	11.1
Wabash.....	5,334	7.8	5,062	8.7
Lake Shore & Michigan South.....	10,263	15.3	8,985	15.4
Pitts., Ft. Wayne & Chicago.....	8,398	12.5	6,680	11.5
Pitts., Cin., Chicago & St. L.....	8,326	12.7	7,601	13.0
Baltimore & Ohio.....	3,855	5.7	3,760	6.4
Chicago & Grand Trunk.....	7,020	10.4	5,202	8.9
New York, Chic. & St. Louis.....	8,104	12.1	6,740	11.6
Chicago & Erie.....	7,676	11.3	7,794	13.4
Total.....	67,199	100.0	58,265	100.0

Of the above shipments 2,173 tons were flour, 23,285 tons grain, 1,861 tons millstuff, 5,441 tons cured meats, 8,735 tons dressed beef, 2,356 tons hides and 4,762 tons lumber. The three Vanderbilt lines carried 33.8 per cent. of all the business, while the two Pennsylvania lines carried but 25.2 per cent. The lake lines carried 88,940 tons, against 71,492 tons during the preceding week, an increase of 17,448 tons.